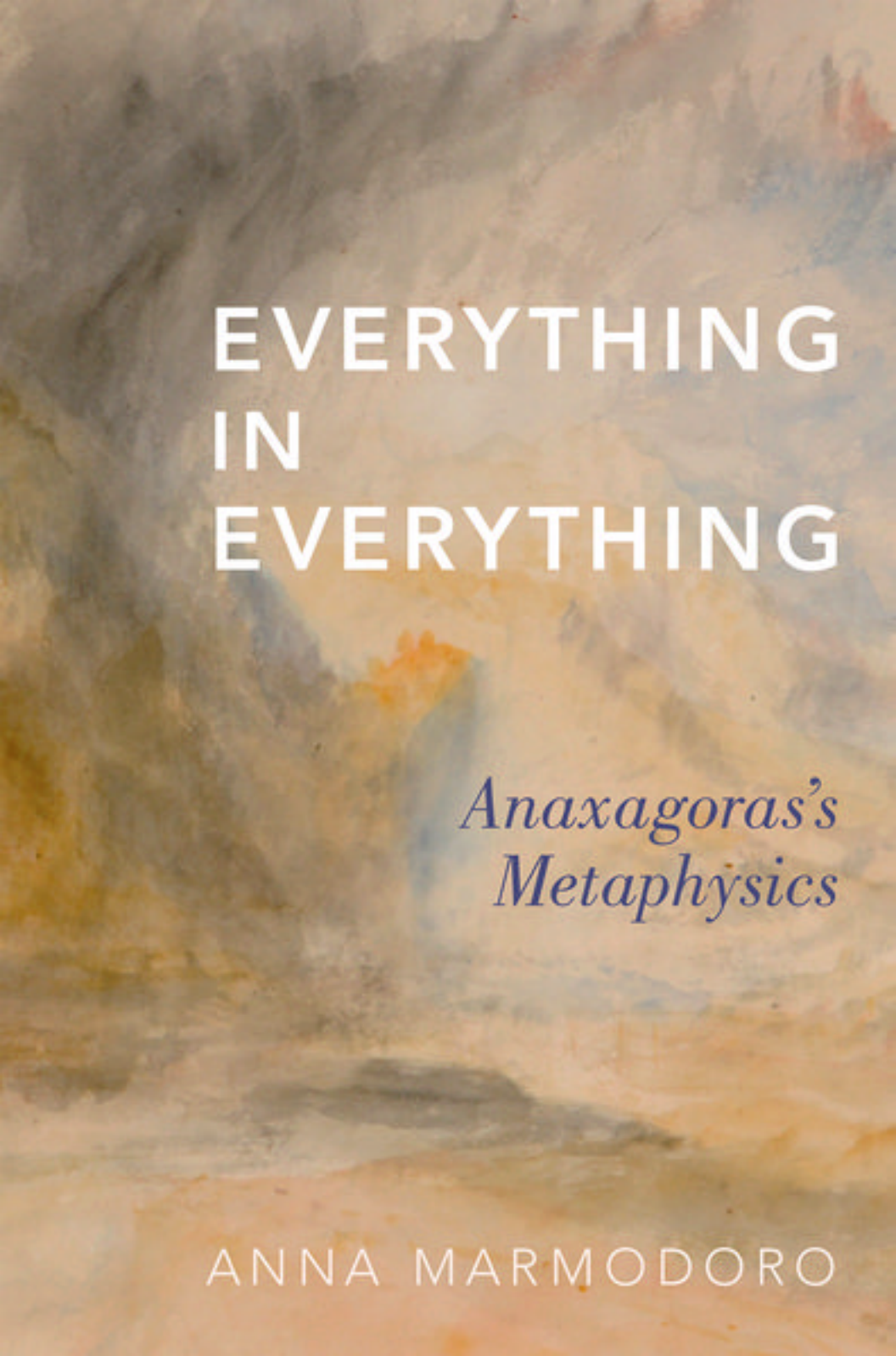




# EVERYTHING IN EVERYTHING

*Anaxagoras's  
Metaphysics*

ANNA MARMODORO

EVERYTHING IN EVERYTHING



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Anna Marmodoro

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# Introduction

How did the world come about? What is it made of? Are there ultimate building blocks to it? If so, what's their nature? How do they compose to make up the material objects we causally interact with? Are the observable changes at the medium-size level of material objects an illusion of our senses, or are they real? If change is real, what is it that remains the same and what doesn't, when things change? This book investigates the answers that Anaxagoras of Clazomenae (fifth century BCE) gave to these and similar questions, at the very beginning of the philosophical investigation of nature in Western thought. Anaxagoras's views are profoundly original. Despite the scarcity of the extant texts, the range of philosophical topics on which he advanced distinctive positions is such that this book can only focus on a few. These will be the ones where Anaxagoras is most groundbreaking with respect to the development of metaphysics, as we identify the subject nowadays. Central to Anaxagoras's thought is the tenet that there is a share of everything in everything—a tenet whose philosophical significance has been much discussed in the scholarly literature, and which has received some attention from modern metaphysicians.<sup>1</sup> Building on the existing literature, this book focuses on that tenet,

1. With reference to the scholarly interest that Anaxagoras's thought has attracted, Richard McKirahan, for instance, writes: "The present century has seen a greater number of radically different interpretations of Anaxagoras than any Presocratic with the possible exception of Empedocles—a remarkable fact given the small number of fragments on which interpretations can be based" (1994: 231). Among the modern metaphysicians who have taken an interest in Anaxagoras are, for instance, Theodore Sider (1993), Ned Markosian (2004), and Hud Hudson (2007).

and aims to advance our understanding of Anaxagoras's worldview so briefly expressed.

Anaxagoras's claim that there is a share of everything in everything encapsulates what I call a theory of *extreme mixture*. Extreme mixture is put forward as a metaphysical solution to the problem of change that Anaxagoras and his contemporaries inherited from Parmenides. Parmenides's veto of the passage from nonbeing to being and vice versa motivated his successors to investigate under which conditions a collection of basic elements, what-is, can make up a new entity, without the elements themselves undergoing any change other than spatial rearrangement. The answer to Parmenides's challenge lies in a theory of *mereological composition*, whereby what-is, the parts, remain always the same, and yet there can be many different resulting wholes, because of the ways the parts recombine.<sup>2</sup> One of Anaxagoras's distinctive stances is to assume that recombination is unrestricted; that is, anything can be added to or extracted from any existing whole. This is what the principle that everything has everything in it allows for. This move enables Anaxagoras to give the most general response that could be given to Parmenides: change is possible and yet there is no generation of what-is from what-is-not, because all there is has already all types of being in it. This is, I submit, the line of thought by which Anaxagoras arrived to theory of extreme mixture.

The metaphysical details of Anaxagoras's view however are still to be explained. What is mixed in his system? How is it mixture? What's the world like if it, and its furniture, are the result of extreme mixing? How can there be different kinds of things, if everything shares the same types of ingredients? Anaxagoras's own words are tantalizingly few on these issues, and commentators have been divided since antiquity on how to interpret them. Multiple alternative

2. Mereological wholes are nothing over and above the sum of their parts, where the parts retain their distinctness and individuality. By contrast, nonmereological wholes are something more than the sum of their parts. Contrast a bundle of sticks with a cake and its ingredients: the former is an example of a mereological whole, the latter of a nonmereological whole. I discuss this distinction with special reference to Aristotle and neo-Aristotelian metaphysics in Marmodoro (2013).

interpretations are possible, and no one of the existing interpretations in the literature is free of difficulties, of either textual or philosophical nature.<sup>3</sup> Is Anaxagoras's dictum that there is everything in everything an interpretative puzzle that we cannot solve? I submit that we can solve it, and that if we do, we pay justice to the thought of a very original ancient thinker, and also gain a viewpoint that is yet to be explored in contemporary metaphysics. I here sketch the thrust of the interpretation that the book motivates—in the forthcoming chapters I argue for it and discuss alternative views in the literature.

Parmenides's principles, which frame the development of Anaxagoras's views, set no restrictions on what it is that what-is has to be. The conceptual space remained open to exploration, and a number of possibilities could be pursued. Empedocles, for instance, developed a mass ontology of four eternal stuffs, the so-called roots, namely fire, air, earth, and water. The forces of Love and Strife cause combination and separation of the four masses, thereby generating the world of our experience. Leucippus and Democritus on the other hand developed an ontology of eternal indivisible atoms moving in the void, bouncing off each other, or becoming entangled with each other. Anaxagoras's ontology too has a bedrock of fundamental elements which are eternal and metaphysically irreducible. Anaxagoras's own examples include the hot, the cold, the wet, the dry, the small, the large, etc. These are instances of opposite physical properties. But even if they are properties, they are not borne by a material substratum. They have a spatiotemporal location, and are observable and measurable. Using a modern philosophical term, we would say that they are tropes.<sup>4</sup> In Anaxagoras's ontology the opposites are substance-like, in the sense that they can move spatially, and also be causal agents. Both points require elucidation; I begin with the former. Anaxagoras thinks of the opposites as entities<sup>5</sup> that can

3. The existing alternative interpretations will be presented and discussed in chapter 4.

4. Anaxagoras's opposites are not universals, as Plato's or Aristotle's forms are.

5. They are tropes; I use the term "entities" loosely here.

be set in motion by a cosmic vortex initiated by *nous*, moving from a state of total mixture to a state of increasing separation.<sup>6</sup> Regarding their causal agency, Anaxagoras thinks that the opposites *make up* material things (I call this their constitutional-causal role), and *qualify* them in certain ways (I call this their qualitative-causal role). With respect to their constitutional-causal role, the opposites make up material things by clustering (in different quantities) at a certain location;<sup>7</sup> accordingly, we would say that for Anaxagoras objects are bundles of tropes.<sup>8</sup> With respect to their qualitative-causal role, Anaxagoras's opposites make a causal difference to the physical world through the same mechanism, that is, by their presence; they aggregate or disperse at certain locations, thereby bringing about "change" there. In these ways, they give rise to different degrees of intensity of the quality they stand for (e.g., hot) in particular regions of space-time.<sup>9</sup> In chapters 1 and 2 I explicate Anaxagoras's account of what the opposites are and how they operate.

Given that the opposites are not metaphysically reducible to anything else from which they could derive their causal efficacy, and as there is no other source of causal efficacy external to them that

6. No full account of what makes it possible for the tropes to be moved spatially has survived, if Anaxagoras gave one. The action of the vortex is described, for example, in B13 (see also B15); the vortex and the workings of the *nous* will be discussed in chapter 5.

7. This stance is expressed, for instance, in B15, which will be investigated in chapter 2, section 2.4.

8. A view of material objects like Anaxagoras's is to be contrasted with the alternative one, held for instance by Aristotle, according to which substances are made up by a substratum that instantiates universal properties. The reader may want to refer to Part IV of Laurence and MacDonald (1998) for a helpful and accessible presentation in modern terms of the two alternative accounts of substance, the substratum- and the bundle-based ones. Of particular relevance to the present discussion is Peter Simons's chapter, "Particulars in Particular Clothing: Three Trope Theories of Substance."

9. Somehow anticipating discussion in power ontology that got started only very recently, Anaxagoras introduces a metaphysics of degrees of intensity of powers. This distinctive feature of Anaxagorean powers is presented in chapter 2. The idea that causal powers may have differ in degrees of intensity is discussed in contemporary metaphysics, e.g., in Barbara Vetter (2015) and Manley and Wasserman (2008).

acts at the *local* level in the world,<sup>10</sup> it is plausible to conclude from the preceding discussion that Anaxagoras's opposites are instances of *causal powers*.<sup>11</sup> In general terms, causal powers are properties defined by the type of change they enable their possessor to suffer or bring about. For instance, magnetism is the capacity to attract certain metals. Causal powers get exercised, and in so doing they change the causal profile of the world, either by themselves changing, or by changing something else, or both. It is by and large assumed in metaphysics that powers need not be exercised at all times. Rather, they exist even when in an inactive state, and in fact they may exist without ever being exercised. The exercise of causal powers requires appropriate conditions,<sup>12</sup> and when such conditions do not obtain, the relevant powers remain "dormant."<sup>13</sup> What then of Anaxagoras's opposites? They have a causal role to play in his system, but can they change (from being dormant to being exercised) and bring about change in a world that obeys Parmenidean rules? In the extant texts of Anaxagoras we find descriptions of active powers. But there are no descriptions of inactive powers, and it is plausible to assume that the conceptual distinction between active and inactive powers is not present in his system. Such a distinction had not yet been conceptualized in the philosophical tradition. In investigating Anaxagoras's

10. Anaxagoras's system include *nous* too and the vortex it generates, but they are causal agents at a *cosmic* level. The topic will be discussed in chapter 5.

11. The reader might find it helpful to pursue further readings on causal powers, for example: Molnar (2003); Mumford (2003); Bird (2007); and Marmodoro (2010). For present purposes I do not draw any distinction between powers and dispositions; some metaphysicians do, e.g., Bird (2013).

12. Some metaphysicians cash out such conditions in terms of the presence of stimuli for the powers (e.g., an appropriate blow for a fragile glass to break); and others in terms of the powers interacting with their manifestation partner powers (e.g., sugar dissolving in water).

13. Causal powers are contrasted with categorical properties (for instance, the sphericity of a ball, by contrast with its capacity to roll), which are causally inert and actual at all times; their definition does not involve reference to any change. That there are categorical properties at all is, however, a disputed issue in metaphysics, as many hold that all properties are dispositional. (I argued elsewhere that the latter is also Aristotle's view, in Marmodoro 2014a).



powers, it important to appreciate their distinctiveness, against the backdrop of the mainstream post-Aristotelian views on power metaphysics that we are familiar with. To understand Anaxagoras's account, we will need to distinguish between the *exercise* and the *manifestation* of a power (rather than between the actual and the potential). In the current debate, metaphysicians by and large identify the manifestation and the exercise of a power, and use the two corresponding expressions as synonyms. By contrast, I submit that in Anaxagoras's system a power becomes manifest specifically when its exercise becomes *perceivable*. So in his system, a power is always exercised, but is not perceivable at all times. This distinction, the textual evidence for it, and the philosophical implications of it are examined in chapter 1.

We can now return to the question of the origin of material objects in Anaxagoras' world, with the benefit of our discussion of the causal role of the opposites. Anaxagoras's view is that everything derives from an original mixture of opposites, set in motion by a vortex that moves elements in the mixture. The opposites thus get rearranged spatially in new ways, coming to be preponderant in some regions of space rather than others. Concentration of particular sorts of power in space results, for Anaxagoras, in increased intensity of the respective powers, which accounts for the preponderance and perceptual manifestation of some powers over others, as will be discussed in chapter 2. This is how stuff such as earth is "generated" by the causal operation of the opposites. Since stuff does not require structure, it can result from the mere movement and bundling of the fundamental powers. On the other hand, Anaxagoras's ontology includes structured material objects (e.g., human beings) too. The simple mechanism of spatial arrangement cannot suffice to account for their complexity, and this calls for an addition to the ontology. The addition are the ordinary biological seeds that Anaxagoras includes in the primordial mixture.<sup>14</sup> On my

14. See, e.g., B4b, which will be examined in chapter 5.

interpretation, the seeds are physical “frames” to which the opposites scattered around by the cosmic vortex get added, thus contributing to the growth of an organism. The seeds too, even if not as fundamental as the opposites from which they are constituted, are causal powers. They are the powers for life in Anaxagoras’s system, in the sense that they are powers for the structural development of organisms in the universe.<sup>15</sup> It is noteworthy to register that both opposites and seeds are powers that do *not* operate by “imparting” their own condition to what they act upon. The opposites make things hot or cold or wet, etc., not by changing what they act upon, but by their presence in them; the seeds grow into organisms by addition of opposites onto the frames the seeds provide, and cannot impart their structure on other objects. This is a distinctive aspect of Anaxagoras’s power ontology, in relation to other ancient (but also modern) ones whereby powers exercise their causal efficacy by changing what they act upon. In conclusion, on the interpretation I want to advance, both the opposites and the seeds are causal powers in Anaxagoras’s system, operating according to a distinctive model of causation that is consistent with Parmenides’s strictures on change.<sup>16</sup>

Anaxagoras does not put any restriction on possible “changes” in his theory (possibly because he finds it metaphysically economical to have a single principle explain all kinds of changes in nature). Anything can “change” into anything, by means of one mechanism only: the movement of the opposites. But if *anything* may be “generated” from anything in his system, and there is no creation of something from nothing, there must be *a share of everything in everything*.

15. If the seeds are the origin of structure in the universe, what structures them? For Anaxagoras it is an irreducibly primitive fact about the universe that the seeds contained in it are structured. They have eternally existed in the original mixture, and in this sense they are as fundamental as the opposites and *nous*. Interestingly, in this, his ontology is similar to Aristotle’s, for whom species forms have always been and shall be in the universe.

16. *Nous* too, as we will see in chapter 5, is a bundle of causal powers (cosmic and cognitive ones).

We are now in the position to see that his theory of extreme mixture follows from the model for causal efficacy that Anaxagoras endorses, in conjunction with the principle that recombination of the elements (the opposites) is unrestricted.

If the elements exist in a state of extreme mixture, they must be *everywhere*. But how can they be everywhere? On the interpretation I want to motivate the answer is: by being unlimitedly *divided*. That is, not simply endlessly divisible, but by being actually divided into parts or shares of which there is no smallest. This is the conceptual breakthrough that, on my interpretation, allows Anaxagoras to meet all his philosophical desiderata. Anaxagoras explicitly offers the unlimited division of what-is as a justification of his stance on extreme mixture:

B6: Since it is not possible that there is a least thing, it would not be possible that [anything] be separated, nor come to be by itself; but just as in the beginning, now too all things are together.<sup>17</sup>

How are we to understand unlimited division of the opposites? Are there parts at the end of it? Of which size? How do they make up material body? A common modern stance is to think that the universe is made of atomic matter, i.e., particles. But what if the world is not composed of ultimate material particles? What if there are no indivisible entities and no bedrock at any depth of the decomposition of reality? What if the universe is not atomic, but *gunky*, with parts of parts “all the way down”?<sup>18</sup> This is conceptual space that has been investigated very little in contemporary philosophy to this day. That the universe might be made out of *material gunk* is a possibility that philosophers are currently beginning to explore, with the aim to

17. B6: ὅτε τοῦλάχιστον μὴ ἔστιν εἶναι, οὐκ ἂν δύναιτο χωρισθῆναι, οὐδ' ἂν ἐφ' ἑαυτοῦ γενέσθαι, ἀλλ' ὅπως ἀρχὴν εἶναι καὶ νῦν πάντα ὁμοῦ.

18. The term “gunk” and the derived adjective “gunky” are expressions introduced in philosophical discourse by David Lewis (1991: 21). Gunk instances are called “hunks of gunk,” following Ted Sider (1993: 2).

develop an ontology of material gunk, and eventually a mathematics and physics of it, so as to understand the world, if it is such.<sup>19</sup> But now consider the possibility that the ultimate elements of our world are not matter, but instances of physical powers, tropes, and further, that these tropes are not atomic, but gunky, i.e., such that they have proper parts ad infinitum.<sup>20</sup> Such power tropes have no smallest part, because each (proper) part of a power trope has (proper) parts. What then? How are we to conceptualize a universe of *power gunk*? The possibility that the building blocks of reality are gunky powers has not even been mapped out, so far, in contemporary metaphysics. Yet Anaxagoras was driven to posit that the opposites, from which everything else in the universe (except *nous*) derives, are endlessly partitioned. Anaxagoras is thereby the first *ante litteram* “gunk lover” in the history of metaphysics.<sup>21</sup> He also has a unique conception of gunk and a unique power ontology: power gunk. Chapter 3 investigates the nature of power gunk and the explanatory utility of the concept for Anaxagoras. While most defenders of an atomless universe nowadays argue for material atomlessness as a conceptual possibility (only), Anaxagoras argues for power atomlessness as an answer to a problem in his philosophy of nature. Power gunk underpins his theory of extreme mixture, which is his solution to the question of how to account for generation and qualitative change without postulating the possibility of creation or qualitative transformation of what there is from what is not.

The thought that matter is divisible has both intuitive appeal and empirical justification, and is a widespread position among ancient and modern metaphysicians. The thought that matter is unlimitedly divisible on the other hand has intuitive appeal, but not empirical justification, which is why there are only few metaphysicians upholding

19. The literature on gunk is becoming increasingly large; one point of reference among many possible is Hudson (2007).

20. Using the definition offered by Cody Gilmore (2014) as a standard one: a proper part of  $x$  is a part of  $x$  that is not identical to  $x$ .

21. The expression “gunk lover” is borrowed from J. Hawthorne and B. Weatherson (2004).

this view (as Aristotle did, for instance). But the thought that matter is unlimitedly divided is neither intuitive nor empirically justifiable, and has very rarely been endorsed in the history of metaphysics; Leibniz is one of the few exceptions. Yet unlimited division is the keystone of Anaxagoras's system—and not only his. There is another ancient metaphysical system, in many respects different from Anaxagoras's, that is built on the same assumption: the Stoics'.<sup>22</sup> Both Anaxagoras and the Stoics posit an unlimitedly divided, physical bedrock of reality. They take this stance for metaphysical reasons, i.e., because this assumption does explanatory work that would have otherwise been left undone in their systems. This explanatory work includes, but is not limited to, the constitution of material objects, change, and causation. A comparison between Anaxagoras and the Stoics gives us a further angle from which we can understand how Anaxagoras's metaphysics sits within its historical philosophical context and what is distinctive about it; the relevant Stoic views are presented and investigated in chapter 6.

In conclusion, Anaxagoras innovates, not only in relation to the philosophical context of his time, but also in the less obvious sense that he has something new to contribute to potentially advance current debates in metaphysics, with respect to his conception of an atomless universe of powers. This book makes a scholarly contribution to our understanding of Anaxagoras's views by offering fresh readings for the texts in which Anaxagoras's principle that there is a share of everything in everything is stated. Such new readings allow us a novel interpretation of the principle, and thus shed light, on the one hand, on the innovative metaphysics Anaxagoras developed, and on the other, on another ancient ontological system that is in relevant respects similar to Anaxagoras's, that of the Stoics. In gaining an understanding of how the ancients conceived of power gunk, we may also enrich our current philosophical understanding of the fundamentals in nature.<sup>23</sup>

22. I am not making here any claim to the effect that Anaxagoras directly influenced the Stoics.

23. Chapters 2, 3, and 4 draw on my article "Anaxagoras's Qualitative Gunk" (2015).

# The Fundamental Items in the Ontology

This chapter introduces what there is, at the fundamental level, in Anaxagoras's ontology. Anaxagoras's views on this issue are developed in answer to such questions as these: How did the world come about? Was it eternally as we experience it now? What is it made of? Is it all flux or all static? Are observable changes in the natural world real, or a delusion of our senses? If change is real, what accounts for it? Some of the conceptual space opened up by these questions was already charted by the time of Anaxagoras, as many great minds were wrestling with these issues. Yet Anaxagoras is a brilliant innovator, as we will see in this and the forthcoming chapters. In a nutshell, his starting point is that there eternally exists a set of building blocks that persist and get spatially rearranged to make up all there is in the world we experience. The building blocks are the so-called opposites; for instance the hot, the cold, the wet, the dry, etc.<sup>1</sup> This chapter reviews the textual evidence and the arguments that support the interpretation that the opposites are fundamental in Anaxagoras's system, with everything else being composed from them (with the exception of *nous*). This interpretation is not uncontroversial, and there exist arguments to the contrary in the literature which will be here reviewed. The chapter then addresses the question of what

1. We will see below and more in detail in chapter 5 that Anaxagoras's ontology includes, in addition to the opposites, a cosmic *nous*, which is not composed from opposites; and also seeds, which are primitively structured clusters of opposites.

the nature of the opposites is. There exists an interpretative line according to which the Anaxagorean opposites are physical causal powers. This interpretation, which is to my mind essentially correct, yet requires careful investigation and argumentation: Anaxagoras's metaphysics of powers and his account of causal efficacy are distinctive. In order to understand their distinctive features, they need to be positioned on the one hand in relation to Aristotle's power ontology, and on the other in relation to modern views on causal powers. The chapter concludes that Anaxagoras does indeed endorse an ontology of causal powers, distributed in spatiotemporal locations in the universe.

### 1.1. OPPOSITES, STUFFS, AND SEEDS

In the extant fragments we find at least an indicative, if not exhaustive, list of what Anaxagoras includes in his ontology: in B4b we read,

Before there was separation off, because all things were together, there was not even any colour evident; for the mixture of all things prevented it, of the wet and the dry and of the hot and the cold and of the bright and the dark, and there was much earth present and seeds unlimited in number, in no way similar to one another. Since these things are so, it is right to think that all things were present in the whole.<sup>2</sup>

πρὶν δὲ ἀποκριθῆναι [ταῦτα] πάντων ὁμοῦ ἐόντων οὐδὲ χροὶ ἔνδηλος ἦν οὐδεμία· ἀπεκώλυε γὰρ ἡ σύμμιξις πάντων χρημάτων, τοῦ τε διεροῦ καὶ τοῦ ξηροῦ καὶ τοῦ θερμοῦ καὶ τοῦ ψυχροῦ καὶ τοῦ λαμпроῦ καὶ τοῦ ζοφεροῦ, καὶ γῆς πολλῆς ἐνεούσης καὶ σπερμάτων ἀπείρων πλῆθος οὐδὲν ἐοικότων ἀλλήλοις. οὐδὲ γὰρ τῶν ἄλλων οὐδὲν ἔοικε τὸ ἕτερον τῷ ἑτέρῳ. τούτων δὲ οὕτως ἐχόντων ἐν τῷ σύμπαντι χρὴ δοκεῖν ἐνεῖναι πάντα χρήματα.

2. This and the following translations of Anaxagoras's texts are from Curd (2010).

This fragment is very rich with information on many aspects of Anaxagoras's thought and it will be a text that we will come back to several times. I will argue below that it describes not only the origin, but also the evolution, of the universe over time.<sup>3</sup> For present purposes, we can parse the fragment into three sets of claims:

- (i) In the original state of the universe, all things present were together; they were mixed.
- (ii) At some point in time there was spatial separation of what there was.
- (iii) What there is includes the opposites (e.g., wet and dry, hot and cold, bright and dark); stuffs (e.g., earth); and seeds.

Are we to understand that all the items mentioned in (iii) were among all things that were together as per (i)? Were all these items present *as such* in the primordial mixture described by (i), before there was separation off? These questions are aimed at understanding whether all these items are ontologically fundamental for Anaxagoras.<sup>4</sup>

3. I share Sedley's (2007: 17) view that for Anaxagoras there is more than one stage in the history of the generation of Anaxagoras's universe as presented in B4b.

4. Scholars have taken different views on this issue. Curd (2010: 153ff.) offers a helpful summary of the positions in the debate and of the arguments from all sides. Those who think the opposites only are fundamental include, for instance Tannery (1886); Burnet (1892 and 1930); Vlastos (1950); Schofield (1980); Warren (2007b); and Sedley (2007). I report here some representative quotations. Schofield thinks that substances and stuffs in Anaxagoras's system are "logical constructions out of opposites" (1980: 116). On the same line, Inwood (1986: 25–26, n. 29): "My own view [is] that the *ἔοντα χρίματα* (i.e. the elemental entities which alone obey Parmenidean rules of permanence) are only the opposites and that everything else, the so-called Empedoclean elements, and flesh, bone etc. is derivative and disobedient to Parmenidean rules of permanence" (1986: 25–26, n. 29); such derivative entities "are only 'virtually' present in the mixture . . . [that is to say] the opposites needed to make them up are present" (1986: 25). Other views, of variable ontological "generosity," are held, for instance, by Guthrie (1965); Barnes (1982: vol. 1, revised); Mourelatos (1987); Furth (1991); Graham (2004); Curd (2010); and others. Barnes, for instance, writes: "Specific talk of the opposites may profitably be dropped from the discussion of Anaxagoras's theory of nature" (1979: vol. 2, 18). Similarly, Reeve: "Any obsession with opposites we seem to find in Anaxagoras is the obsession of his predecessors not his own" (1981: 96). We thus have a full spectrum of views in the literature. In particular, there is a line



Let us first examine the status of stuff, and whether it is analyzable metaphysically into something more fundamental or not. Fragment B15 is quite explicit that,

The dense and the wet and the cold and the dark come together here, where <the> earth is now; but the rare and the hot and the dry <and the bright> moved out to the far reaches of aether.

τὸ μὲν πυκνὸν καὶ διερὸν καὶ ψυχρὸν καὶ τὸ ζοφερὸν ἐνθάδε συνεχώρησεν, ἔνθα νῦν <ῆ> γῆ, τὸ δὲ ἀραιὸν καὶ τὸ θερμὸν καὶ τὸ ξηρὸν <καὶ τὸ λαμπρὸν> ἐξεχώρησεν εἰς τὸ πρόσω τοῦ αἰθέρος.

Taking earth as an example of stuff for Anaxagoras, and assuming that the same will apply *mutatis mutandis* to all kinds of stuffs, B15 indicates that for Anaxagoras stuffs are (metaphysically) reducible to opposites. It is the moving about and aggregation of certain opposites that makes earth, for instance, come to be.<sup>5</sup>

of interpretation that considers stuffs irreducible. On this view stuffs such as blood or gold are not composed out of the opposites, but exist primitively as such (see, e.g., Graham 2004). I note here that the interpretation I will present in chapter 4 does not depend on giving the opposites the particular status of sole type of building block in Anaxagoras's ontology; it can be developed also on the view that stuffs are as fundamental as the opposites.

5. The issue of "generation" of stuffs is actually more complex than this, because the mere compresence of the relevant opposites does not suffice for us to discern earth there, even though it is only their compresence that is needed for the composition of earth. The difference lies between compresent relevant opposites of low strength or intensity, and compresent relevant opposites of high strength or intensity, where "high" means "perceptible." So it is only when the compresent opposites are intense enough to be perceptible that we can recognize and classify their aggregative composition as earth. The challenge for Anaxagoras will be to explain higher and lower intensity of opposites. We will come to this thorny problem in chapter 2.

Patricia Curd asked, in personal correspondence, why Anaxagoras's respect for Parmenidean concerns about change would not also apply to the composition (and decomposition) of stuffs. For example, if according to Anaxagoras flesh cannot be extracted from nonflesh, how can flesh be generated out of nonflesh in the composition of flesh out of its opposite constituents, as my interpretation suggests? Or, if heat is extracted from, say, flesh, which is hot, how can heat come out of what is not heat? These derivations have the makings of generation, which is outlawed by Parmenides

We saw that in the inventory of what there is in Anaxagoras's world, there are seeds too. The seeds have been matter of much controversy among the commentators. In this chapter I will limit myself to discussing only whether the seeds are primitive or derivative in Anaxagoras ontology; I will postpone to chapter 5 further questions for discussion. In B10 we read,

For in the same seminal fluid there are hair, nails, veins and arteries, sinew, and bone, and it happens that they are imperceptible because of the smallness of the parts, but when they grow, they gradually are separated off. "For how," he says, "can hair come from what is not hair and flesh from what is not flesh?"

καὶ γὰρ ἐν τῇ αὐτῇ γονῇ καὶ τρίχας εἶναι καὶ ὄνυχας καὶ φλέβας καὶ ἄρτηρίας καὶ νεῦρα καὶ ὀστέα καὶ τυγχάνειν μὲν ἀφανῇ διὰ μικρομέρειαν, αὐξανόμενα δὲ κατὰ μικρὸν διακρίνεσθαι. πῶς γὰρ ἄν, φησὶν, ἐκ μὴ τριχὸς γένοιτο θρίξ καὶ σὰρξ ἐκ μὴ σαρκός;

Assuming for present purposes that the animal seed is an instance of what Anaxagoras meant by seeds in general (which is a point that will be argued for in chapter 5), what we learn from B10 is that the seeds are made out of stuffs, such as nail, hair, bone stuff. But stuffs are made out of opposites. Thus the opposites are metaphysically fundamental and both stuffs and seeds are composed from them. On the other hand, as I will argue in chapter 5, the seeds are not

and should be respected by Anaxagoras, and yet are not, on my interpretation. The way I see Anaxagoras avoiding such Parmenidean objections is by a sophisticated combination of epistemological and ontological positions. Anaxagoras is a *phenomenological emergentist*, and an *ontological mereologist*. I develop this interpretation in section 1.4 of this chapter and in section 2.4 of chapter 2. Briefly here, stuffs such as earth or flesh only appear, phenomenologically, to be of such kinds, while ontologically they are aggregates of opposites in different densities. Thus when heat comes from flesh, it in fact comes from heat in the compresence of hot + soft+ heavy + flexible + pale + etc., which are phenomenologically flesh. When flesh comes to be, this involves only the displacement of opposites, which phenomenologically appear to be flesh (or would appear such to an observer). None of these violates Parmenidean strictures that Anaxagoras respects in his ontology.

exhaustively analyzable in terms of opposites only, in the sense that they are irreducibly structured and thus they are more than com-present opposites. Structure is irreducible to opposites, but requires explanation when we find it in the world. Anaxagoras introduces structure primitively into his ontology, as do other ancient philosophers, e.g. Aristotle, with his eternal species. Such irreducible structures are necessary for the metaphysical work the seeds are posited to do in Anaxagoras's system. Also not metaphysically reducible to the opposites is *nous*; again, due to the constraints determined by what *nous* is introduced to do, *nous* cannot be the result of composition of opposites, as we will see in chapter 5.<sup>6</sup>

We are now in a position to see that not everything that is listed in B4b has been eternally in existence as such, but only the opposites and the seeds (and of course *nous*). This point will be discussed below, but B15 has already given us an indication that earth came about at some (unspecified) point in time, due to the spatial movement the opposites were subject to. The sort of spatial movements that give rise to stuffs are referred to in the set of claims (ii) above as "separation off." Fragment B4b then describes not one but at least two stages in the universe's development (or three if we count the process of separation as a stage of its own): the primordial state of total mixture and a stage in which stuffs and seeds are discernible.<sup>7</sup> On the other hand, this latter stage too, according to Anaxagoras's

6. In B12, for instance, we read, "*Nous* . . . has been mixed with no thing, but is alone itself by itself" (καὶ μέμικται οὐδενὶ χρήματι, ἀλλὰ μόνος αὐτὸς ἐφ' ἑαυτοῦ ἔσται).

7. Patricia Curd, in correspondence, objected to the evolutionary account I offered here, on the basis of syntactical reasons. She thinks that what is said about earth in B4b does not introduce a second phase in the evolution of the cosmos, but rather describes the initial state of the primordial mixture. If so, earth, and stuffs more generally, as well as seeds, were all in the primordial mixture. I want to stress that such a position is compatible with my interpretation, because, although I hold that stuffs are reducible to opposites, and composed by the movement brought about by the vortex, both these claims are compatible with the claim that there were stuff and seeds primitively in the primordial mixture. Stuff and seeds can be reducible; some of these are primitively present in the cosmos; while some subsequently generated. If so, there are

cosmic narrative, is followed by further developments, which include the appearance of living beings. For example, in B4a we read,

For shortly after the beginning of the first book of his *Physics*, Anaxagoras says this, “Since these things are so, it is right to think that there are many different things present in everything that is being combined, and seeds of all things, having all sorts of forms, colours, and flavours, and that human and also the other animals were compounded, as many as have soul.”

*λέγει γὰρ μετ’ ὀλίγα τῆς ἀρχῆς τοῦ πρώτου Περι φύσεως Ἀναξαγόρας οὕτως· τούτων δὲ οὕτως ἔχόντων χρή δοκεῖν ἐνεῖναι πολλά τε καὶ παντοῖα ἐν πᾶσι τοῖς συγκρινομένοις καὶ σπέρματα πάντων χρημάτων καὶ ιδέας παντοίας ἔχοντα καὶ χροιάς καὶ ἡδονάς. καὶ ἀνθρώπους τε συμπαγῆναι καὶ τὰ ἄλλα ζῶα ὅσα ψυχὴν ἔχει.*

In sum, there are then a number of stages of the universe’s history Anaxagoras hints at in the extant texts: a stage of primordial mixture, a stage where stuffs and seeds become discernible, and finally the state of the world as we know it (inhabited with living beings). We now turn to examining by which mechanisms stuffs and seeds respectively derive from the opposites, beginning with an investigation of the metaphysical constraints at play in Anaxagoras system.

## 1.2. DOES MATTER “MATTER” TO ANAXAGORAS?

On the interpretation I am developing, Anaxagoras assumes that the opposites can aggregate into stuffs, such as earth and flesh—thus endorsing an early version of the view that things are bundles of

stuffs and seeds in the primordial mixture, and they are not subject to the everything-in-everything principle, but only the opposites are mixed in this way.

property instances. Such stuffs, along with further constituents—the seeds—contribute to the composition of individual organisms such as animals and plants.<sup>8</sup> The opposites are not types, or universals—rather, they are tropes. The total amount of a specific kind of property in the world, e.g., the opposite hot, is the totality of all instances of heat in the world; the opposite dark is the totality of all instances of darkness in the world, etc. These are not fusions of hot *objects*, or dark objects, etc. An important aspect of Anaxagoras's ontology is that properties are not instantiated by coming to qualify matter or inhere in matter:<sup>9</sup> they exist in nature and are located in space and time just as tropes are. They are *not material*, but they are *physical*.<sup>10</sup> We can understand their status by analogy, for instance, with the way in which a magnetic field is physical, but not material. A field is a physical quantity that has a value for each region in space and time. Likewise, Anaxagoras's opposites are physical quantities in space and time, e.g., of heat, of darkness, etc., and have a value in every region of space-time, indicating the intensity of each property there. The intensity of a property in a region may increase, according to Anaxagoras, by accumulation of instances, moved around by the vortex, as we read for instance in B4b, B9, B12 (more on this in chapters 2 and 5). Anaxagorean opposites are also subject to physical causation of different kinds. For instance, they are impacted upon and set in movement by the cosmic vortex generated by *nous*. The

8. Anaxagoras's account of how individuals come about will be examined in chapter 5.

9. With a similar approach, although developed very differently from mine, Montgomery Furth writes that "the theoretical concept of *matter* in Aristotle's sense plays essentially no role in Anaxagoras' theory" (1991: 97). Elsewhere Furth states: "My interpretation . . . takes the elementary building-blocks of Anaxagoras' theory to be entities totally other than an Aristotelian *hupokeimenon*" (1991: 124). Furth's own interpretation of Anaxagoras's metaphysics is examined in section 4.4 of chapter 4.

10. The notion of properties extended in space, but not somehow grounded in something else—matter—might strike the modern reader as unfamiliar. It is however in line with modern accounts of individuals as bundles of tropes. In antiquity the prime example of this conception of properties as instantiated but not en-mattered are the instances of Plato's Forms.

opposites can be impacted upon in Anaxagoras's ontology precisely because they are not abstract properties of an Aristotelian ontology, but rather fully-fledged physical entities.

It might perhaps be a (philosophical) common-sense expectation that Anaxagoras would think of the opposites as qualifying matter, but I submit that this is not the case. There are a number of plausible reasons to think that Anaxagoras's ontology does not include matter. First, an argument *ex silentio*: matter is never mentioned in the extant fragments.<sup>11</sup> Second, in a world where there is no qualitative change, there is no metaphysical work for underlying matter to do.<sup>12</sup> Hence Anaxagoras would have no motivation for positing that opposites qualify something that underlies them and persists through the loss of acquisition of opposite properties.<sup>13</sup> Third, *if* Anaxagoras thought that the opposites were en-mattered in a sort of (Aristotelian) featureless substratum that they could each qualify, it would be historically rather odd that Plato or Aristotle does not engage at all with Anaxagoras's view of matter in the *Timaeus* or the *Physics*, respectively. It was not until the later period of Plato that the notion of something that is the ontological receptacle of properties was introduced. The notion of a material substratum bearing properties is, in short, a theoretical acquisition that (arguably) Plato gains only in the *Timaeus* and Aristotle develops as of the *Physics*. Does it follow then, from what I have argued so far, that Anaxagoras's world is an immaterial one, where there are no material objects but only physical tropes? The textual evidence provides a clear answer to this question. For example, earth, air and aether are mentioned in B1; B2 talks about air and aether; B4a talks about earth and products that result from its cultivation; B4b and B10 mention color, which is a feature of material objects,

11. This cannot of course be a decisive argument, for Anaxagoras's work has not been preserved in its entirety; nevertheless it is a point that deserves due consideration.

12. This is the converse, as it were, of Aristotle's principle in *Physics* I.7, that if there is matter, there can be qualitative change.

13. On this topic see also appendix 1.A at the end of this chapter.

etc. Although for Anaxagoras there is no matter underlying the opposites, matter *results from* the opposites (as we read, for example, in B15). In conclusion, Anaxagoras has no reason to think of matter as underlying the opposites. On the one hand his ontology does not include universals, so no material substratum is needed to facilitate their instantiation in the world. On the other hand, he does not allow for any substantial or qualitative change in his system, and excludes the transformation of one opposite into the other, so no material substratum is needed to serve as a surviving pure or physical potentiality for any elemental transformations. In sum, Anaxagoras's opposites are properties in space and time which do not qualify underlying characterless substrata of any kind, but which are primitively and eternally present in the world.

### 1.3. THE CONCRETENESS OF POWER

This section addresses a potential worry the reader might have concerning the status of Anaxagoras's opposites *qua* not en-mattered. Are his opposites "ghostly" entities, and is his world so? The answer in short is no. Anaxagoras's ontology delivers a universe that is as concrete as ours, and as concrete as the world of Aristotle, who first introduced matter in the history of metaphysics. To appreciate this point, it will be helpful to very briefly compare Aristotle's and Anaxagoras's ontologies—both are power ontologies,<sup>14</sup> but one of them makes matter a fundamental principle of things in nature, while the other does not reify matter. What distinguishes Anaxagoras's *physical* ontology from Aristotle's *material* ontology? Both Anaxagoras and Aristotle talk of earth, water, flesh, etc., though these result from different types of composition in each of the two ontologies.<sup>15</sup> But to understand the difference between Anaxagoras's

14. See appendix 1.A at the end of this chapter.

15. Anaxagoras pioneers a mereology à la David Lewis, where the whole is identical to the sum of its parts; while Aristotle develops nonmereological hylomorphism,

and Aristotle's accounts of the concreteness of physical objects, we need to determine what such stuff or body is made of according to each account. In Aristotle's account, stuff is made of powers that are en-mattered, while in Anaxagoras's they are not en-mattered. But what type of entity is the matter that Aristotle reifies in his system, and is there a metaphysical function it serves which remains unaccounted for in Anaxagoras's system? This investigation takes us to Aristotle's notion of ultimate substratum.<sup>16</sup>

Aristotle's search for the ultimate substratum that underlies all being in objects leads him to matter, in *Metaphysics* VII.3. In Aristotle's thought experiment, when abstracting away all forms from an object, one reaches the underlying matter, which is not qualified in any conceivable way; it is neither an individual, nor a particular quantity of matter. The ultimate substratum "is of itself neither a particular thing nor of a particular quantity nor otherwise positively characterized; nor yet negatively, for negations also will belong to it only by accident" (1029a24–25). Since there is no being or particularity qualifying the ultimate substratum, the substratum is not even a bare particular.<sup>17</sup> But when we abstract away all form and all particularity from the object, what is left?<sup>18</sup> I submit that abstraction separates (in the mind of the person performing the abstraction) the form from the object it belongs to, in which it is instantiated.<sup>19</sup> Even a form like Plato's wisdom, abstracted away from Plato, is uninstantiated. It is not the identity of the abstracted form that determines whether it is

where the whole is something over and above the sum of its parts. On the latter see Marmodoro (2013).

16. In this context the examination of Aristotle's positions needs to be brief, since the explanatory target is Anaxagoras's ontology.

17. The literature on Aristotle's so-called "stripping away" thought experiment in *Met.* is vast. One of the latest treatments of it is Lewis (2013).

18. The ultimate substratum is not matter in the sense of body underlying and constituting some individual, e.g., an animal or a plant. Such matter is an abstract entity that we individuate by abstracting away the form of an object.

19. See also on this topic Scaltsas (1994) and, among the most recent studies specifically of the abstract in Aristotle, Bäck (2014).



instantiated or not.<sup>20</sup> Its ontological unity with the individual existing in nature determines this; the process of abstraction, in a sense, severs this unity. An abstracted form is therefore an uninstantiated form, for forms are not instantiated in virtue of their nature, but are made so by being ontologically unified with their subjects. On this interpretation (which I developed in Marmodoro 2009 and 2013), matter qua ultimate substratum is the ground of the instantiation of forms.<sup>21</sup> If we consider, e.g., heat and abstract from it the form of heat, what remains is its ultimate substratum—namely, its ground of instantiation. But this ground of instantiation does not give the form that is instantiated in it either being or particularity. What it gives it is actuality, and the form is thereby instantiated. Beyond this notion of matter qua ground of instantiation in Aristotle there is also the notion of matter qua body, as that which remains throughout changes and transformations of objects in nature. Such matter is an abstraction, characterized as an underlying physical entity. However, this is qualified matter, and hence not relevant to our present concerns of what underlies qualities.

Turning now to Anaxagoras's ontology: his opposites exist in nature. Are they thereby instantiated? They are instances of physical powers, but they are not instantiated in any kind of substratum. The reason for this is that Anaxagoras has no universal forms, no underlying matter, and no abstraction of forms from individuals in nature. Hence, there cannot be a relation of instantiation at work in his system, and in this sense there is nothing in his ontology that can be instantiated. The opposites are in nature, and are actual, for they are instances of physical powers qua tropes in specific spatio-temporal locations. In Anaxagoras's system, each trope of an opposite is metaphysically simple.<sup>22</sup> By contrast in Aristotle's system

20. The abstracted form could be universal or particular, e.g., wisdom or Plato's wisdom, but for simplicity of exposition I will assume it to be a universal.

21. See also Marmodoro (2013).

22. I do not see the degree of strength of a power trope as being incompatible with its being simple.

a trope is a composite of matter and form, where form is instantiated in matter. The difference, therefore, between Anaxagoras's and Aristotle's metaphysics of powers does not lie in the concreteness of the powers—both Anaxagorean and Aristotelian powers are concrete. The metaphysical role of matter in Aristotle's system does not involve ensuring the concreteness of bodies, or deriving stuff from the basic powers. Importantly however, while Aristotle reifies form as an abstract object in his ontology, Anaxagoras does not. There are no abstract entities in Anaxagoras's ontology—no universals, or even particular forms.

Thus Aristotle's and Anaxagoras's ontologies differ in an important respect. Aristotle can explain similarity between concrete objects, but Anaxagoras cannot. For Aristotle, two hot things share the form of heat, a universal—this is how similarity is explained in his realist metaphysical framework. Anaxagoras on the other hand cannot account for similarity (at least for what we know of his theory from the extant texts).<sup>23</sup> For the same reason, Anaxagoras cannot explain change and transformation, without *ex nihilo* creation. Aristotle accounts for the qualitative as well as substantial changes a body may undergo in terms of the body losing a form, while the matter remains and acquires a new form. This mechanism allows us to understand change as "replacement" of forms in the same matter, rather than as a succession of instantiated properties in the same location. So Aristotle distinguishes physical continuity from identity, and explains physical continuity in terms of the same quantity of matter remaining through change of form. By contrast Anaxagoras recognizes only physical identity, e.g., there being one and the same opposite at a particular spatiotemporal location. Reifying a quantity

23. Anaxagoras *could* treat similarity between objects as a primitive, and explain the difference between properties (e.g., between heat and brightness, which he assumes in his system) through a nonrealist account of properties, for instance as Rodriguez-Pereyra (2002). On the other hand, there is no textual evidence that Anaxagoras thought along these lines. My point here is only to register that there is a possible and sound way forward for explaining resemblance, available to someone holding an Anaxagorean ontology.

of matter is not an open possibility for Anaxagoras, because doing so requires the possibility of abstracting a form from some object, and individuating the (abstract) remainder. In other words, such a move presupposes the reification of an (abstract) form, which are absent from Anaxagoras's ontology.

There is also much to be explored on common ontological features between Anaxagoras's opposites and Plato's Forms. Nicholas Denyer (1983) among others has argued that, thinking of the Forms as concrete and particular chemical elements (rather than as universals), along the lines of Anaxagoras's ontology, makes much of what Plato says about the Forms more reasonable and acceptable. In broad agreement with Denyer's line of thinking, to my mind too, Platonic individuals are collections of instances of Forms (i.e., of immanent Forms). In that sense, like Anaxagoras's individuals and unlike Aristotle's individuals, Plato's individuals are matterless. They are bundles of properties.

#### 1.4. PARMENIDEAN CONSTRAINTS ON CHANGE

As the textual evidence reviewed in section 1.1 already indicated, Anaxagoras is well aware that in the course of the history of the universe things have changed—namely, from a state of even mixture of the opposites to worlds inhabited by human beings devoted to agriculture.<sup>24</sup> To facilitate our understanding of Anaxagoras's metaphysical account of how these developments take place, it will be helpful to set out some standard distinctions concerning change. *Creation*

24. B4a: "There are cities that have been constructed by humans and works made, just as with us" (καὶ τοῖς γε ἀνθρώποισιν εἶναι καὶ πόλεις συνημμένας καὶ ἔργα κατεσκευασμένα, ὥσπερ παρ' ἡμῖν). I will return to the analysis of this fragment in chapter 5.

is the coming about of something from nothing. *Generation* is the coming about of something new from something already in existence in virtue of the latter being substantially transformed by acquiring or losing some of its essential properties—for instance, when flour, sugar, and butter are made into a cake, or the parents' semen and egg become an offspring. *Alteration* on the other hand takes place when something already in existence acquires or loses some of its nonessential properties—for instance, when Socrates goes from being pale to becoming tanned. There is a sense in which in all three cases—creation, generation, and alteration—something new results from the change. Even in the case of Socrates's tanning, there is a new compound of Socrates and the property of being tanned that did not exist as such before the relevant alteration took place. The question we want to examine here is: what type(s) of change did Anaxagoras allow in his ontology? This question has been cast in the secondary literature in terms of whether Anaxagoras was an heir of Parmenides in his thinking about change, and if so, to what degree, as well as in which ways, if any, was he responding to Parmenides in drawing up his own account of reality. The issues here are vexed with controversy in the scholarly literature, beginning with the interpretation of Parmenides himself.

However, most scholars think that Anaxagoras was a follower of Parmenides in the sense that his metaphysics prohibited generation and change from nonbeing.<sup>25</sup> I endorse this conclusion, and in lieu of adding my own arguments for it, in what follows I will briefly argue against the alternative view, taking John Palmer (2009) as representative.

25. See for instance Curd (2010: 142) as representative of the state of the field. Those who think that Anaxagoras was a strict Parmenidean believe that Anaxagoras would have posited "a multitude of material beings that replicate as far as possible the attributes of Parmenidean Being" (in Palmer's words, 2009: 225). For instance, Vlastos (1950: 327) and Guthrie (1965: 281), among others, think this; the latter writes that Anaxagoras's account of the natural world was developed to accommodate the radical idea that "every natural substance must be assumed to have existence in the full Parmenidean sense."

Palmer's aim is to "deconstruct" the "myth" that Anaxagoras is an intellectual heir of Parmenides. His first set of reasons draw on his interpretation of Parmenides. The second set of reasons concern philosophical difficulties that Palmer believes Anaxagoras would be prey to if he endorsed Parmenides's views. In discussing this second group of reasons, Palmer claims that "the assumption that Anaxagoras aimed to accommodate purportedly Parmenidean strictures against non-being proves untenable on internal grounds . . . [It] either requires arbitrary restrictions or leads to absurdity" (2009: 227). The presumed absurdity is that in Anaxagoras's universe "one should refrain from characterizing anything as such or as having any definite characteristics, except in a phenomenal manner relative to the particular level of observation. With the exception of the *Nous* nothing in Anaxagoras is just what it appears to be" (2009: 242). It is not possible within the scope of this study to pay full justice to Palmer's arguments on this topic. Yet the reasoning leading Palmer to the presumed absurdity raises questions that we need to consider here. On the interpretation of Anaxagoras's metaphysics which I will develop in the following chapters, it is not true that "nothing in Anaxagoras is just what it appears to be." Palmer claims this because he holds that Anaxagoras thinks that *nothing* is "anything as such or as having any definite characteristics." (We will see below that this is not in fact Anaxagoras's view.) As I understand Palmer, he reads Anaxagoras as treating everything in his ontology the way he treats stuffs. For example, Anaxagoras holds that flesh is a kind of stuff that contains hair and nails in small quantities in its constitution—flesh is a mixture of different kinds of stuff. We consider it uniform only because it appears thus to us. By extension, Palmer claims, for Anaxagoras *any* uniformity is phenomenal, relative to some level of possible observation, even if not at our perceptual level. Hence, for Palmer, everything in Anaxagoras is a mixture, even when it does not appear to a perceiver to be such. On account of this reasoning, Palmer dismisses the possibility that "Anaxagoras's basic stuffs are designed to replicate the attributes of

Parmenidean Being” (2009: 242). This reasoning is not, however, apt to explain Anaxagoras’s ontology. For Anaxagoras, not everything is constitutionally mixed. Importantly, the opposites are not, for in Anaxagoras’s system there is pure hot, pure cold, etc.; instances of these pure powers can be inseparable, as Anaxagoras argues in B3 and B8, but inseparability doesn’t entail constitutional mixing.<sup>26</sup> Thus Palmer’s charge that Anaxagoras’s system would face absurdity that if he were operating within a Parmenidean framework must be rejected.

In what follows I will use the adjective “Parmenidean” as a shorthand for a philosophical position about change whose formulation is by and large (but not uncontroversially) attributed to the historical Parmenides, and I will assume that Anaxagoras holds this position, on the basis of the textual evidence we have of his thought. Anaxagoras holds that there is no creation *ex nihilo* (or destruction; see, for instance, B3: “what-is cannot not be”), no emergence of substances or qualities, and no qualitative alteration of the opposites over time. Among the extant texts where Anaxagoras’s views are reported, B5, B10, and B13 attest to this:

B5: He makes clear that none of the homogeneous stuffs either come to be or passes away, but that they are always the same.

*ὅτι δὲ οὐδὲ γίνεται οὐδὲ φθίρεται τι τῶν ὁμοιομερῶν, ἀλλ’ αἰεὶ τὰ αὐτὰ ἐστί...*

B10: When Anaxagoras discovered the old belief that nothing comes from that which is not in any way whatsoever, he did away with coming-to-be and introduced dissociation in place of coming-to-be.

26. I will examine these fragments and Anaxagoras’s argument for the necessary inseparability of the opposites in chapter 3, section 3.1. As to the argument why the opposites are not constitutionally mixed: on the one hand there is no textual evidence to the effect that they are; on the other hand, if they were, absurdities would follow (as Edward Hussey cogently argues; see chapter 4, section 4.2).

ὁ δὲ Ἀναξαγόρας παλαιὸν εὐρών δόγμα ὅτι οὐδὲν ἐκ τοῦ μηδαμῆ <μηδαμῶς ὄντος> γίνεται, γένεσιν μὲν ἀνήρει, διάκρισιν δὲ εἰσῆγεν ἀντὶ γενέσεως.

B13: He says that coming-to-be is nothing other than separation, that separation comes to be on account of motion, and that *Nous* is the cause of motion.

*εἴπερ τὴν γένεσιν οὐδὲν ἄλλο ἢ ἔκκρισιν εἶναι φησι, τὴν δὲ ἔκκρισιν ὑπὸ τῆς κινήσεως γίνεσθαι, τῆς δὲ κινήσεως αἴτιον εἶναι τὸν νοῦν.*

What there is at the fundamental level of reality is always *numerically* and *qualitatively* the same (B5: ἀεὶ τὰ αὐτὰ ἐστὶ), and Anaxagoras banishes from his ontology both creation and substantial as well as qualitative emergence. All that happens when something new comes about is rearrangement by means of spatial movement of what there (already) is. Coming to be and passing away are processes of “combination and separation”; B10 and 13, but also B17 indicate this:<sup>27</sup>

B17: Anaxagoras says clearly in the first book of the *Physics* that coming-to-be and passing-away are combining and dissociating, writing this: “The Greeks do not think correctly about coming-to-be and passing-away; for no thing comes to be or passes away, but is mixed together and dissociated from the things that are. And thus they would be correct to call coming-to-be mixing-together and passing-away dissociating.”

*σαφῶς δὲ Ἀναξαγόρας ἐν τῷ πρώτῳ τῶν Φυσικῶν τὸ γίνεσθαι καὶ ἀπόλλυσθαι συγκρίνεσθαι καὶ διακρίνεσθαι λέγει γράφων οὕτως· τὸ δὲ γίνεσθαι καὶ ἀπόλλυσθαι οὐκ ὁρθῶς νομίζουσιν οἱ Ἕλληνες· οὐδὲν γὰρ χρῆμα γίνεται οὐδὲ ἀπόλλυται, ἀλλ’ ἀπὸ ἐόντων χρημάτων συμμίσγεται τε καὶ διακρίνεται. καὶ οὕτως ἄν*

27. This combination and separation is only ever partial, because nothing can be separate out completely from everything else; see chapter 3, section 3.1.

ὀρθῶς καλοῖεν τό τε γίνεσθαι συμμίσγεσθαι καὶ τὸ ἀπόλλυσθαι  
διακρίνεσθαι.

For Parmenidean reasons, which I mentioned above, Anaxagoras does not admit in his ontology the possibility of emergence of new forms of being, as from composition. While holding his mereological principle, which identifies composed wholes with the sum of their parts, Anaxagoras allows for *phenomenal emergence* of beings that are over and above their parts. In other words, for Anaxagoras, ontological composition and emergence are phenomenal rather than real. Accordingly, he develops the notion of things becoming or being *manifest*, namely perceptually evident (ἔνδηλον).<sup>28</sup> It appears to perceivers that there are wholes, where (in reality) there are only parts. As a consequence, he is a *perceptual relativist* about ontological composition, i.e., he relativizes composition to perception. For example, stuff that is composed of a number of compresent opposites, e.g., earth or blood, exists as a kind relative to our perceptual powers. As we have seen in B15, the “generation” of earth, for instance, is just the becoming visible of certain concentrations of opposites in a spatiotemporal location. Of course, this does not mean that there is no earth or blood. What it means is that earth and blood are mereological sums or aggregates, each constituted by a different set of powers, with different properties. However, they are not emergent wholes, and their uniformity as stuff is phenomenal only. (Although he was a contemporary of Protagoras, it does not appear that Anaxagoras singled out the human perspective as privileged, in the way that Protagoras held that “man is the measure of all things: of the things that are, that they are, of the things that are not, that they are not”

28. For example, Anaxagoras writes in B1 that in the cosmic mixture “because all things were together, nothing was evident on account of smallness . . . when they were all together, nothing was clear and manifest because of their smallness” (καὶ πάντων ὁμοῦ ἐόντων οὐδὲν ἔνδηλον ἦν ὑπὸ σμικρότητος). I return to this topic (and the existing discussion in the literature) in chapter 4, and also in chapter 6; see also Schofield (1980), chapter 4.



[DK 80B1]. Anaxagoras seems to relativize composition and emergence to perceivers in general.)

It is important to emphasize that Anaxagoras's account of the generation of material objects and organisms is not eliminativist—it does not deny them a place in Anaxagoras's system. Rather, on his account such entities exist, but are ontologically fully reducible to the fundamental building blocks out of which they are composed (e.g. seeds and opposites in the case of living beings), and their arrangement in space-time.<sup>29</sup> Hence, my proposed interpretation of Anaxagoras's views on change avoids two alternative problematic readings: that living beings and material objects are *ab aeterno* part of the ontology as primitives, on the one hand; and on the other, the idea that there are no things at all in the system because all there “really” is are the opposites.<sup>30</sup>

In conclusion, for Anaxagoras there is no initial creation from nothing, no passage from nonbeing to being and from being to non-being, and finally, no qualitative alteration of what is, or generation of new types of being. Does this mean that, for Anaxagoras, the world is changeless? We already saw that there is clear textual evidence that the universe's development has undergone different stages. In B17, Anaxagoras provides an explanation of the phenomenon we describe as coming to be and passing away of material objects in terms of combination and dissociation of the fundamental elements in the universe. This stance allows him to have a very parsimonious account of change in general, which is reduced to spatial movement of what

29. Their arrangement in space-time does raise difficulties, which will be investigated in chapter 5.

30. The former of the two is the reading that Eric Lewis for instance gives; he believes that “Anaxagoras took the bold step of having it that all individual organisms have always existed” (2002: 22). On Lewis's interpretation Anaxagoras “makes the individual organisms eternal, via his theory of seeds”; there are externally in the world “seeds of all the individual organisms that will ever exist,” that is, “homunculi of all individual organisms” or tiny instances of all individuals (2000: 18). On account of the arguments I offered in this sections, it seems unjustified to saddle Anaxagoras with the view Lewis attributes to him, which has been criticized also in Palmer (2009: 239–40). I return to the topic of the seeds in chapter 5.

there is at the fundamental level. In this qualified sense, Anaxagoras does admit generation in his cosmology. Apart from stuff, the account can apply to different kinds of alteration, for instance, the case of Socrates becoming tanned. Tanned Socrates can be thought to be a new entity that comes about when the property “being tanned” comes to apply to Socrates. But Socrates being tanned is only the result of a color uniformity that emerges at a certain perceptual level. When something “new” comes about, this happens by means of spatial movement of what has always been in existence. What is it then that has always been in existence, and has been and will always be qualitatively the same in Anaxagoras’s universe?

### 1.5. THE CAUSAL EFFICACY OF THE OPPOSITES

How does the world and everything else in it come about? And what explains all that happens within it? Everything, for Anaxagoras, is due to the opposites, the seeds and the activity of *nous*. What *nous* is and how it operates will be examined in chapter 5; the seeds will be examined there also. This section addresses specifically the question of what the opposites are. There is a long-established exegetical tradition that takes Anaxagoras’s opposites to be *powers*.<sup>31</sup> Gregory Vlastos is the most significant exponent of that tradition, writing that

the most important step ever taken toward the true understanding of Anaxagoras, was made by Tannery’s suggestion that the ultimate ingredients . . . are the hot and the cold, the dry and the moist, and all the traditional “opposites” of Ionian cosmology. These are conceived . . . as substantial “quality-things” or,

31. See among others Tannery (1886: 280ff.); Burnet (1892: 288–90, and 1930: 263–64); Vlastos (1950: 41–42); Schofield (1980: 120).

better still, *as forms of energy or “power” (dynamis)*. (1950: 41–42, my emphasis)<sup>32</sup>

Perhaps the idea that opposites are powers seemed so compelling to Vlastos that he did not think that further arguments would be required in support of this interpretation, appealing as he did only to what he saw as the achievements made in his contemporary philosophical context. Thinking of them as powers is indeed a promising direction; I share Vlastos’s view in this respect. There are however important issues to investigate. On the one hand, there are clear indications in the extant texts that Anaxagoras’s opposites have causal efficacy with respect to change—they make things happen.<sup>33</sup> If there is a plausible way to explain how Anaxagorean opposites can have causal efficacy, there is a strong motivation to understand them as causal powers. On the other hand, we cannot attribute to Anaxagoras a conception of the causal efficacy of the opposites that runs contrary to his adherence to the Parmenidean strictures discussed in section 1.2. To establish the interpretative claim that Anaxagoras’s opposites are what we call causal powers, one needs to set out what the criteria (or our criteria) are for something to be a power, and examine whether the opposites meet them.<sup>34</sup> From this interpretative exercise, we will note a number of interesting considerations for ancient and contemporary power metaphysics.

32. Vlastos adds by way of support of his claim: “That Anaxagoras shared the traditional view of the ‘powers’ is a reasonable assumption, and this not in spite but because of the scantiness of our notices on this topic. Had he deviated in any significant way, some trace of the innovation would have been left in the record” (1950: 43).

33. The textual evidence that the opposites have causal efficacy in Anaxagoras’s world will be reviewed below.

34. The word *dynamis* does not appear in the extant fragments but this should not be thought of as a difficulty, partly because of the scarcity of the surviving texts, partly because we cannot expect at this stage of development of the history of philosophy an already codified terminology for metaphysics. Relatedly, Sedley (2007: 15) argues that it is too early in the history of philosophy to think that Anaxagoras introduced technical terms. (Rather, according to Sedley, Anaxagoras tries to “expunge” misleading expressions from ordinary language. I raise the same points concerning the so-called seeds, in chapter 5.)

In general terms, causal powers are properties essentially defined by their causal efficacy, that is, the exercise of their powerfulness (e.g., the hot is defined by heating). There are two influential ways of thinking about the causal efficacy of powers that are relevant to the present investigation: one is of Aristotelian descent, and the other has been put forward in contemporary metaphysics in recent years.<sup>35</sup> It is important to introduce them in order to examine whether Anaxagoras's opposites align with either of these two mainstream conceptions of powers and causal efficacy, and if not, to distinguish what is distinctive about Anaxagorean powers. In what follows I will argue that Anaxagoras does not think of opposites as causal powers in either of the two post-Aristotelian ways we are familiar with.

According to Aristotle's still influential conception of powers, a power is causally efficacious two things obtain. First, the power is activated by undergoing a transition from the state of potentiality to the state of actuality and thus changing (intransitively). Second, the power changes (transitively) something else. For example, *x*'s power to heat gets activated and heats up something colder, which thereby changes by being heated. Both the intransitive and transitive changes in question are qualitative changes. Because Anaxagoras does not allow for qualitative change in his ontology, it is evident that he cannot admit that powers change, transitively or intransitively—as Aristotelian powers do.<sup>36</sup> There is however an alternative conception of powers, held in modern metaphysics, which might be thought to be a helpful model to understand how Anaxagoras thinks of powers. According to this alternative conception, powers exist in potentiality, and their manifestation is the production of a new, different power (also in

35. It is not anachronistic to open up a theoretical possibility for thinking of Anaxagoras's opposites on the basis of current research in metaphysics. The goal is to understand Anaxagoras in his own terms, but as we approach him from our contemporary standpoint, we need to be able to understand what is different between his way of thinking of causal powers and ours, and this is why introducing ours is relevant.

36. Appendix 1.A at the end of this chapter brings out noteworthy connections between Anaxagoras's and Aristotle's power ontology.

potentiality); for example fragility is manifested in the new powers of the fractured glass that come about.<sup>37</sup> Mumford and Anjum, for instance, who hold this view, claim that “causation happens when powers do their work” (2011: 30), and that the work of a power is “producing its own manifestation” (2011: 8).<sup>38</sup> So causation happens when a power produces its manifestation. But if a power and its manifestation are related as producer and product, the manifestation of a power is something numerically different from the power itself, and it is something the power is in fact *causally* related to. Confirmation that Mumford and Anjum think of the manifestation of a power as something numerically different from the power itself can be seen in their explanation that “the manifestation of a power will . . . be itself a *further power* or cluster of powers” (2011: 5, my emphasis). On their model, the manifestation of a power consists in its *replacement* with a new one. This new power is real, though unmanifested (until it gets together with its own manifestation partner, and produces a further power, etc.). Although the powers themselves are not involved in a change of state from potentiality to actuality, the view calls for *new* powers that come to be when the original ones manifest. But this runs contrary to the Parmenidean stance against change, and so plausibly this conception of powers cannot be attributed to Anaxagoras.

So in which way, if any, are Anaxagoras’s opposites causally efficacious? In what follows I will address the issue of whether and how the distinction between potentiality and actuality applies to Anaxagorean powers, and what type of causal efficacy his powers have. Because Anaxagoras did not want to introduce processes of qualitative change in his system, he did not allow for physical activities in the universe other than spatial movement. Thus, he did not have a metaphysics

37. This approach does not distinguish between a power’s being exercised and a power’s being manifested.

38. Mumford and Anjum advocate this position in their *Getting Causes from Powers* (2011). See also my contribution to the book symposium on *Getting Causes from Powers* (McKittrick et al. 2013).

of interaction among physical powers— that is, an interaction that brings about changes of state other than through movement. Yet he is reported in A90 to have thought that, for example, the sun’s heat burned things or made water evaporate:

Anaxagoras says that in the beginning, after the marshy water was burned by the revolutions of the sun and after the very rare moisture evaporated, the remainder that settled out was salt and bitterness. (Aëtius 3.16.2)

Ἄ. τοῦ κατ’ ἀρχὴν λιμνάζοντος ὕγρου περικαέντος ὑπὸ τῆς ἡλιακῆς περιφορᾶς καὶ τοῦ λεπτοτάτου εξατμισθέντος εἰς ἀλυκίδα καὶ πικρίαν τὸ λοιπὸν ὑποστῆναι.

What are we to make of this testimony if we take it at face value? Presumably, Anaxagoras would have explained the causal efficacy of the sun in terms of the spatial movement of the fundamental tropes in his system. Nevertheless, even causing mere movement requires causal impact and some form of interaction. Anaxagoras seems not to have singled out this state of interacting powers as a distinct ontological state that he has to account for. Anaxagoras’s powers have only one state, which is the same when they are interacting with other powers and when they are not.<sup>39</sup> In other words, he does not distinguish a state of potentiality from one of where powers are exercised. He did not have the metaphysical distinction (drawn first by late Plato,<sup>40</sup> and developed by Aristotle) between

39. Mourelatos (1987) finds this position widespread among Parmenides’s immediate successors:

It is important to note that when the Pluralists speak of a *dynamis* or “power” present in a fundamental constituent, they must be taken to imply a power that is continuously, even eternally manifest; nothing like the Aristotelian scheme of potencies that are triggered into actualities can be presupposed; nothing like Aristotelian qualitative alteration or qualitative interaction can be envisaged. (1986: 134–35)

40. For instance, in the *Theaetetus*, at 197b–d, where Plato distinguishes possessing from having a coat, and by analogy, possessing and having knowledge.

potentiality and actuality.<sup>41</sup> Since Anaxagoras's powers can and do interact in appropriate conditions, e.g., when the sun revolves in the example above, we can plausibly assume that the state in which they always are is an active state—whether interacting or not. Anaxagoras's position is thus distinct from that of Aristotle on the one hand, and from that represented, e.g., by Mumford and Anjum on the other.

Now on to the type of causal efficacy Anaxagorean powers can have. They can have a constitutional—as well as qualitative—causal role, by making other things be of the kind that the *preponderant* opposite in them is. They do so by exhibiting their (different kinds of) natures when their instances are present in appropriate degrees of quantity or intensity in a specific spatiotemporal region of the universe.<sup>42</sup> This is a conception of causal efficacy that does not involve the change or activation of any particular power itself, but only the effect of their accumulation. The opposites come to predominate in specific spatiotemporal regions of the universe because of external factors (the vortex started off by *nous*, as we will see in chapter 5) operating on them and redistributing them in space. In B13, for instance, we read,

When *Nous* began to move [things], there was separation off from the multitude that was being moved, and whatever *Nous* moved, all this was dissociated; and as things were being moved and dissociated, the revolution made them dissociate much more.

καὶ ἐπεὶ ἤρξατο ὁ νοῦς κινεῖν, ἀπὸ τοῦ κινουμένου παντὸς ἀπεκρίνετο, καὶ ὅσον ἐκίνησεν ὁ νοῦς, πᾶν τοῦτο διεκρίθη· κινουμένων δὲ καὶ διακρινομένων ἡ περιχώρησις πολλῶ μᾶλλον ἐποίει διακρίνεσθαι.

41. On Aristotle, see Marmodoro (2014a, 2015).

42. In this sense they have *constitutional* causal efficacy. See also sections 1.4 in this chapter and 2.4 in chapter 2.

Thus, Anaxagoras conceives of causation as actual quantitative transmission (by spatial movement) of, e.g., “bits” or tropes of heat when something is made hotter: it happens by power transference.<sup>43</sup>

In conclusion, in thinking about causal powers, Aristotle, as well as his successors (up to our modern times), presupposes a distinction between powers being in potentiality and being in actuality, which, as we saw above, Anaxagoras does not have. Anaxagoras’s powers are always active—they undergo no change of state when they interact with other opposites. Nevertheless, they do cause “change”—change of the sort that I will discuss in more detail in chapter 2—when some of the opposites come to predominate *modulo* perception in some spatiotemporal location over other opposites. In this connection, one may think of an object before the hot comes to predominate in it as being potentially hot, and after it comes to predominate in it, as actually hot. Generalizing from this, one may think that in Anaxagoras’s system objects have the potentiality to change. But Anaxagoras does not give us any reason to think that he singled out states of potentiality of objects in his ontology. This potentiality of objects to change should not be confused with the potentiality of the opposites to change status, from being in potentiality to being in actuality, when engaging in causal interaction. It is metaphysically significant that Anaxagorean opposites do not undergo a change from potentiality to actuality and that they do not change each other when they causally interact. If they could change themselves, or one another, there would be a passage from

43. The idea that causation happens because of the passing around or transmission of properties was widespread in antiquity. This is known in the literature as the Contagion Model of causation. The model was also revived in early modern philosophy; see for reference, e.g., O’Neil (1993: 44). Aristotle too talked of the transmission of the form of the agent’s power onto the patient’s power. But for Aristotle, this is a figurative way of speaking; transmission of form is not literal in his system, like the physical transference of a quantity, e.g., of a book or of heat, but more like the transmission of information. The causal agent’s form comes to be the patient’s form as a result of changes induced in the patient by the agent. I discuss Aristotle’s account of causation in Marmodoro (2007, 2014a, 2014b).



nonbeing to being, which would defy Anaxagoras's explicit endorsement of Parmenidean principles.<sup>44</sup>

## 1.6. AN EARLY POWER ONTOLOGY?

On the interpretation I am motivating, Anaxagorean opposites do bring about “change” in objects (e.g., from being cold to being hot), and make things be of the kind the predominant opposite in them is. Still, this conception of causal efficacy does not involve a causal effect of an opposite on the nature of another opposite. A cold object may become hot, but the existing tropes of cold in the universe always remain cold. So on this ground, my account might be taken to suggest that Anaxagorean opposites are categorical, i.e., inert properties.<sup>45</sup> Yet I submit the opposites are causally efficacious, only in a different way than what we (post-Aristotle) might expect, and thus are not inert properties. They are powers, and in fact “pure” powers, that is, with no categorical base. Two things are to be established for my conclusion to be justified: that the opposites are powerful—each in ways specific to the kind of opposite it is, and that they *are* powers (rather than, they *have* powers); in other words, all there is to their nature is their powerfulness. Concerning the first point, we can see that opposites are powerful, for instance, in B16, where Anaxagoras claims that “from the earth, stones are compacted by the cold” (ἐκ δὲ τῆς γῆς λίθοι συμπίγνυνται ὑπὸ τοῦ ψυχροῦ). It is the cold that compacts stones from earth, not, for instance, the hot or the bright. This suggests that each kind of opposites has its own specific

44. In this sense, there is an analogy between Anaxagoras's way of obeying Parmenides's strictures on change and the atomists'.

45. There exists a vast literature on the distinction between powers and categorical properties. See, for instance, Armstrong (2005).

powerfulness.<sup>46</sup> Concerning now the second point, we saw above, and we will investigate further in chapter 2, that opposites change a thing's constitution, not by qualitatively changing the existing elements in the thing's constitution, but by a change in the aggregation of opposites of specific kinds. It is the presence of opposites and their predominance that determines the nature of objects.

If we suppose that the opposites are causal powers, Anaxagoras can be thought to have a power ontology only if all there is in his system is a power and/or can be reduced to powers. Regarding *nous* and the seeds, we will see in chapter 5 that they too are powers. Regarding stuff, my position is that it can be metaphysically reduced to the opposites. There is no scholarly consensus on this point. In support of my interpretation I will here engage with an objection to this purported reduction by Daniel Graham (2004), as representative of that line of thinking. Graham writes:

I believe the Tanner-Burnet view is false (2004: 2). . . . According to the Tannery-Burnet view (as I understand it) stuffs such as flesh and iron are understood as being composed of qualities such as hot, cold, wet and dry. Inasmuch as, e.g., flesh is just a ratio of qualities, an ultimate description of the world would not need to list flesh, but only hot, cold, dry, wet, etc. (2004: 3)

Graham develops two arguments based on methodological considerations against the Tanner-Burnet view. The first one is that

if the Tanner-Burnet view is true, we should expect some systematic difference in treatment of the opposites and the stuffs to appear, some indication that powers are causally, ontologically, or logically prior to stuffs. But while B4b hints at a categorial distinction between powers and stuffs, it falls short of establishing the priority of the former over the latter. (2004: 6)

46. In general, the opposites have local causal efficacy, while *nous*, via the vortex, has cosmic causal efficacy, as I argue in chapter 5.

One question to consider here is whether it is fair to make such a methodological demand of Anaxagoras. He did not have the same classification system concerning priority that we have, following Aristotle. On the other hand he has criteria of his own, based on constitutional considerations. I believe that his main classificatory criteria for distinguishing ontologically prior and secondary entities are (i) whether  $x$  is structured or not; and (ii) whether  $x$  is mixed or not. The second of Graham's arguments is that on the Tanner-Burnet interpretation, Anaxagoras

turns out to be a more radical reductionist than Empedocles. For while Empedocles reduces one set of stuffs to another set, Anaxagoras reduces all stuffs to entities of a different and more primitive categorial order all together: stuffs are derived from powers. Hence there is a type difference between the items to be reduced and the items to which they are reduced with cross categorial boundaries. There is no clear-cut historical antecedent to this kind of reductionism; no earlier Presocratic seems to have made such a leap. It is . . . possible that . . . Anaxagoras felt impelled to make a bold innovation. . . . But if so, he was going out on a philosophical limb. (2004: 9)

To put my response in simple terms, stuffs for Anaxagoras consist of opposites in the way that a soup is made of tomato juice, water, and oil. Anaxagoras did not think there is a cross-categorial difference between, e.g., the cold, the dark, the dense, and earth, any more than he would have thought that there is a cross-categorial difference between tomato juice and tomato soup. The reason for this is that he did not think of the opposites the way we think of properties, or even the way Aristotle thought of form—that is, as abstract universal entities whose nature is in contrast to material stuff. Anaxagoras's opposites are not abstract, but physical, and his stuff too is not material (in the aforementioned Aristotelian sense), but physical. What we call material body is for Anaxagoras just a mixture of the physical opposites, as argued in section 1.4 above. Graham has yet a third

objection to the reduction of stuff to opposites in Anaxagoras's system:

Anaxagoras' commitment to pluralism in metaphysics seems to square poorly with reductionism. . . . It is certainly not a classic reductionist strategy to reduce an uncountably large number of phenomena to an uncountably large number of principles. It seems strange for a philosopher with such a powerful tool as reductionism *not* to exploit for the purposes of simplification. (2004: 12)

Although in reading Anaxagoras we may be inclined to pay special attention to his reductionism, reflecting our own 20th- and 21st-century philosophical interests, what seems to have made a deep impression on Anaxagoras is the qualitatively irreducible differences between properties such as the hot, the cold, the bright, the blue, the sweet, etc. In this, reifying numerous primitive opposites and asserting their irreducibility, Anaxagoras is a pioneer and perhaps even influenced Plato's Theory of Forms.

A final point of engagement with Graham's interpretation: I take all properties to be opposites, for Anaxagoras. So, color, for instance, consists in the opposites dark and light, while on Graham's interpretation, what he calls nonopposite properties (which are features of the primitive stuff and become perceptible through preponderance) are *not* entities for Anaxagoras; color is a case in point. That is to say, such properties are not reified, nor are they reduced to the opposites. He writes,

The phenomenal stuffs . . . are . . . mixtures in which a given element iterates its own properties at the phenomenal level; the properties of the phenomenal stuff are not a function of several primitive elements, but the expression of a single element. (2004: 4)

But, if this is so, the ontology attributed to Anaxagoras lacks an account of properties, and in fact, of properties that surface at the phenomenal level. I submit this is an uncharitable interpretation of Anaxagoras's system.

To conclude this section, material objects (in the broadest sense, including animals and plants) have capacities, abilities, dispositions, etc.; in short, they are powerful. Anaxagoras's metaphysics aims to explain how objects are powerful. There are two routes, broadly speaking, that he could have taken to deliver this explanation. He could have posited that at the fundamental level there were items that *had powers*, or that *were powers*. If Anaxagoras chose the former route, his ontology would have made only a partial contribution toward explaining what it is for an object to be powerful: he would have explained the object's having powers in terms of further objects (its constituents) having powers. Anaxagoras did not choose this route. Instead, he chose to posit powers first, i.e., to build the world from powers, the opposites, and to explain the "generation" of powerful objects as resulting from the aggregation of these powers. This appears to be a more complete and yet economical explanation of the powerfulness of objects. I conclude that it is textually and philosophically plausible to take Anaxagoras to have developed a powers-only ontology.

## 1.7. CLOSING REMARKS

This chapter has introduced the metaphysical foundations of Anaxagoras's philosophy of nature. Anaxagoras develops a cosmology according to which the world that we experience originates from a cosmic mixture of all elements together. As we will see in more detail in chapter 5, at some point in time the mixture is set in motion by a cosmic vortex, by *nous*'s intervention. This results in the scattering of the elements in different locations and the formation of the world of our experience. The fundamental elements in question are properties, and more specifically, what the ancients called the opposites, such as hot and cold, wet and dry, rough and smooth, etc. The fact that Anaxagoras thinks of the elemental properties as opposites motivated the suggestion (by Tannery, Burnet, and Vlastos) that they are what we call causal powers. I offered arguments and textual evidence in support of this interpretation. As causal powers, they are of a distinctive kind, tailored

to fit the metaphysical strictures of Anaxagoras's ontology. The metaphysical status of the opposites is to be tropes; they are physical and concrete; they do not qualify matter, in the way in which, for instance, Aristotelian forms do. Matter as such is not part of Anaxagoras's ontology, in the sense that he does not have abstraction and instantiation as metaphysical tools at his disposal, and thus he does not conceptualize a substratum that survives qualitative or substantial change. From these points, two further tenets of Anaxagoras follow: that material objects are bundles of tropes, and that qualitative change, generation, and destruction in the physical world are reducible to spatial movement of tropes. Thus the opposites are physical properties *from which* matter results. If the opposites are the fundamental constituents of reality, and they are causal powers, it is plausible to interpret Anaxagoras's theory as an early power ontology.<sup>47</sup>

## 1.A. APPENDIX: ANAXAGOREAN VERSUS ARISTOTELIAN POWERS

This chapter has already introduced some points of analogy and contrast between Anaxagoras's and Aristotle's metaphysics.<sup>48</sup> The purpose of this appendix is to identify the key fundamental assumption they share, notwithstanding the profound differences in their philosophical systems. The assumption is that the building blocks of all there is in the physical world are powers. Aristotle offers his famous analysis of the simple elements, namely fire, air, water, and earth, in *De Generatione et Corruptione*. In allotting the

47. I am currently investigating in other work the extent to which there is broad consensus on this metaphysical starting point across different thinkers and different historical periods in ancient Western thought. My working hypothesis, which drives my research program "Power Structuralism in Ancient Ontologies," funded by the European Research Council (award number 263484) is that nearly all ancient ontologies posit powers as the sole type of fundamental building block of reality. It is interesting to note that the powers-only approach appears to be the starting point in ancient metaphysics, rather than an alternative to mainstream metaphysics, as power ontology is today.

48. The material presented in this appendix is more extensively discussed in Marmodoro (2014a, chapter 1; 2016b; and also 2016a).

fundamental properties that characterize these elements, Aristotle narrows down the candidates to the tangible contraries (329b6–9), and of those, the ones that are powers: “capable of acting and being affected . . . said of things in virtue of their acting upon something else or being acted upon by something else” (329b20–21).<sup>49</sup> He goes through an analysis of the list of contrary powers of what is tangible, and concludes that they are all reducible to four primary or fundamental ones: heat, cold, wetness, and dryness (330a24–29). The four simple elements are constituted of the four primary powers: “Fire is hot and dry, whereas Air is hot and moist . . . and Water is cold and wet, while Earth is cold and dry” (330b3–5). There are no further fundamental properties, and these four constitute the simple elements from which all else is composed. The simple elements can reciprocally transform into one another by gaining or losing their powers—for instance:

There will be Air, when the cold of the Water and the dry of the Fire have passed-away (since the hot of the latter and the moist of the former are left); whereas, when the hot of the Fire and the moist of the Water have passed-away, there will be Earth, owing to the survival of the dry of the Fire and the cold of the Water. (331b14–18)

What Aristotle is describing in the passage above is the constitution of the most fundamental level of reality. In sum, there are four types of primary power, which do not exist separately each on their own, but pair up and constitute the simple elements. The simple elements—earth, water, air, and fire—are the most fundamental separable things in nature.<sup>50</sup> Each element has two contraries, and when they come in contact, the interaction between them results in, e.g., the heat of fire overpowering the coldness of the water, while the wetness of water overpowers the dryness of fire, giving rise to what is hot and wet, namely air (e.g., steam). Accordingly, Aristotle distinguishes the underlying matter, the contrary properties, and the composite of the two, namely the simple elements:

Our own doctrine is that although there is a matter of the perceptible bodies (a matter out of which the so-called elements come-to-be), it has no separate existence, but is always bound up with a contrariety. A more precise account of this has been given in another work; we

49. The translations of Aristotle’s texts are all from Barnes (1984).

50. They are separable at least in principle, since they are not found in pure form in nature, but mixed between them. For instance, in the *Generation and Corruption* we read that “fire and air, and each of the bodies we have mentioned, are not simple but combined” (330b21–23).

must, however, give a detailed explanation of the primary bodies as well, since they too are similarly derived from the matter. We must reckon as a principle and as primary the matter which underlies, though it is inseparable from, the contrary qualities: for the hot is not matter for the cold nor the cold for the hot, but the substratum is matter for them both. Thus as principles we have firstly that which is potentially perceptible body [i.e. matter in potentiality], secondly the contraries (I mean, e.g. heat and cold), and thirdly Fire, Water, and the like. For these bodies change into one another (they are not immutable as Empedocles and other thinkers assert, since alteration would then have been impossible), whereas the *contraries do not change*. (329a28–b2, my emphasis)

The difference between this account and how Anaxagoras would describe the phenomenon is that while Aristotle explains change in terms of physical continuity and change of form, Anaxagoras would think of it in terms of a succession of opposites in the same location. It is important to note that this difference does not entail a difference concerning whether powers are concrete or not, as argued in section 1.3 of this chapter. The fact that Anaxagoras's powers are not en-mattered only entails that we cannot divide them by abstraction into a form and a substratum; whereas we can divide Aristotelian powers this way (for instance, when the form of heat comes to be instantiated where the form of cold was in a pot, as the fire warms the pot up). Properties, for Aristotle, are not subject to change. This is because abstract forms *explain* change; if they could change, a regress would develop, whereby a further form-type entity would be needed to explain the change. Since properties themselves do not change, when change occurs, it is the entity qualified by a property that changes, by acquiring a new property in place of the former one. For Anaxagoras, fundamental properties do not change, either, because they are simple (that is, not "divisible" into substratum and form); it is this that blocks change at the fundamental level of reality. Yet entities qualified by fundamental properties do "change" (e.g., water can warm up), by gaining or losing simple fundamental properties—the opposites.



## The Principles Governing the Ontology

A prominent philosophical concern of Anaxagoras's is to account for the observable natural phenomena within the Parmenidean strictures examined in chapter 1, that is, without allowing generation or destruction or even qualitative change of what there is, but only spatial movement. That this is an important concern for Anaxagoras is clear from the frequency with which the issue is mentioned in the extant texts.<sup>1</sup> What makes the puzzle of change particularly challenging for Anaxagoras is that he sees no reason to think that changes in nature are somehow restricted in such a way that only things of a certain kind can derive from things of some other kind. On the contrary, for him *anything can derive from anything*.<sup>2</sup> No argument, or even an empirical observation directly attributable to Anaxagoras, that might have motivated him to take this unrestricted view of change has been preserved in the extant texts.<sup>3</sup> So while it is clear from the extant texts that Anaxagoras does believe in unrestricted

1. With the caveat that not all Anaxagoras wrote was preserved, so we can only talk of relative frequency.

2. For example, Anaxagoras could have posited that flesh comes only from flesh; but he rather thinks flesh may come from gold, and earth from pulp.

3. Only B10 suggests that the development of a complete offspring out of the seminal fluid of the father might have appeared to Anaxagoras a case in point of unrestricted transformation. B10 is discussed below. On the other hand Aristotle reports that it was an empirical observation that led Anaxagoras (and his followers) to commit to unrestricted extraction:

derivation, we can only speculate as to why he took that view, as the textual evidence does not give us any pointers. I submit that having a mechanism that allows for unrestricted derivation might have seemed to Anaxagoras a simpler and more economical metaphysical view, and thus preferable to others on what we would nowadays call methodological grounds. It is also the case that Anaxagoras's metaphysics would not have the resources for restricting transformation, if this were a desideratum in his system; perhaps this was also a consideration that played a role in Anaxagoras's refraining from restricting transformation.

If, then, anything can "come out" of anything in Anaxagoras's system, how is this possible? What metaphysics backs up Anaxagoras's stance? This chapter and the following two will investigate this question. They will introduce and investigate the theory of extreme mixture that underpins Anaxagoras's position regarding unrestricted derivation. This theory is famously encapsulated in the principle that there is a share of everything in everything and some other central principles that this chapter will investigate. The next one, chapter 3, will concentrate on the everything-in-everything principle, and argue that a sound understanding of this principle requires a shift in interpretative approach, which is put forward in the chapter, along with the textual evidence that supports it. Following on this discussion, chapter 4 will review the existing main interpretations of the tenet that there is a share of everything in everything, and the difficulties that those interpretations encounter. This will provide further arguments in support of my proposed interpretation, by way of presenting the existing alternatives in the literature, and the difficulties they are prey to.

So they [the Anaxagoreans] assert that everything has been mixed in everything, because they saw [ἐώραν] everything arising out of everything. (*Physics*, 187b1–2)

I assume that Aristotle did not literally believe the Anaxagoreans saw everything, but only dissimilars arising from dissimilars. In view of the ancient's predilection for the principle that "like causes like," even a single instance of "unlike causing unlike" would have sufficed to motivate an alternative account of causation.

## 2.1. THE PRINCIPLE OF UNIVERSAL EXTRACTION

There is clear textual evidence to the effect that Anaxagoras's way to avoid the generation of being from nonbeing is to posit that generation is somehow equivalent to the "extraction" of something  $x$  from something else  $y$  within which  $x$  was already in existence. As we know from chapter 1, in Anaxagoras's world things exist as bundles of tropes, and this is why extraction of  $x$  from  $y$  amounts to the spatial separation of  $x$  from whatever else there is in the bundle that makes up  $y$ ; *idem* if  $y$  is taken to be the original mixture itself, from which every thing in the natural world derives. This extraction mechanism does not contravene any Parmenidean stance, and yet it accounts for the coming about of something "new."<sup>4</sup> The principle is stated in B13: "Coming-to-be is nothing other than separation" (τὴν γένεσιν οὐδὲν ἄλλο ἢ ἔκκρισιν εἶναι).<sup>5</sup> It is also reiterated more fully in B17:

Anaxagoras says clearly in the first book of the *Physics* that coming-to-be and passing-away are combining and dissociating, writing this: "The Greeks do not think correctly about coming-to-be and passing-away; for no thing comes to be or passes away, but is mixed together and dissociated from the things that are. And thus it would be correct to call coming-to-be mixing-together and passing-away dissociating."

4. There are however philosophical complications to be investigated in the case in which the generated item is an individual being, e.g., a human; or a bodily part, e.g., in the case of tree branch budding; or in the case of the growth of organic matter, e.g., in the case of nail or hair becoming longer. These complexities, which, e.g., B10 raises, are the topic of chapter 5, and involve the study of the role of the seeds in Anaxagoras's system.

5. The full statement is as follows: "He [sc. Anaxagoras] says that coming-to-be is nothing other than separation, that separation comes to be on account of motion, and that *Nous* is the cause of motion" (εἴπερ τὴν γένεσιν οὐδὲν ἄλλο ἢ ἔκκρισιν εἶναι φησι, τὴν δὲ ἔκκρισιν ὑπὸ τῆς κινήσεως γίνεσθαι, τῆς δὲ κινήσεως αἴτιον εἶναι τὸν νοῦν).

σαφῶς δὲ Ἀναξαγόρας ἐν τῷ πρώτῳ τῶν Φυσικῶν τὸ γίνεσθαι καὶ ἀπόλλυσθαι συγκρίνεσθαι καὶ διακρίνεσθαι λέγει γράφων οὕτως· τὸ δὲ γίνεσθαι καὶ ἀπόλλυσθαι οὐκ ὁρθῶς νομίζουσιν οἱ Ἕλληνες· οὐδὲν γὰρ χρῆμα γίνεται οὐδὲ ἀπόλλυται, ἀλλ' ἀπὸ ἐόντων χρημάτων συμμίσγεται τε καὶ διακρίνεται. καὶ οὕτως ἂν ὁρθῶς καλοῖεν τό τε γίνεσθαι συμμίσγεσθαι καὶ τὸ ἀπόλλυσθαι διακρίνεσθαι.

Along the same lines, in B10 Anaxagoras is reported to have expressed his puzzlement about the generation of things, in these terms: “For how,’ he says, ‘can hair come [γένοιτο] from what is not hair, and flesh from what is not flesh?’” In a sense things such as hair do come from things that are not hair, i.e., ultimately the seminal fluid. However, the way that hair comes from the seminal fluid is not by generation (γενέσθαι) of something new that wasn’t there, but rather by separation (διακρίνεσθαι)<sup>6</sup> of what was already there in the seminal fluid. Reading on in B10,

For in the same seminal fluid there are hair, nails, veins and arteries, sinew, and bone, and it happens that they are imperceptible because of the smallness of the parts, but when they grow, they gradually are separated off.

καὶ γὰρ ἐν τῇ αὐτῇ γονῇ καὶ τρίχας εἶναι καὶ ὄνυχας καὶ φλέβας καὶ ἀρτηρίας καὶ νεῦρα καὶ ὀστέα καὶ τυγχάνειν μὲν ἀφανῆ διὰ μικρομέρειαν, αὐξανόμενα δὲ κατὰ μικρὸν διακρίνεσθαι.

Since in each existing thing, as well as in the cosmic mixture, there are all opposites (in different degrees of concentration), and the opposites can be moved around spatially by the vortex initiated by *nous*, and thus scattered or concentrated in space, it follows for Anaxagoras

6. More generally, the terms that Anaxagoras uses for talking about generation as extraction are forms of the verb κρῖναι (and compound verbs deriving from it).

that anything can “come out” of anything else. This commitment to unrestricted derivation is expressed in the literature in terms of what is known in the literature as the *Principle of Universal Extraction*:

**UE-P:** Any opposite or combination of opposites can be extracted from any other combination of opposites.

As mentioned in the opening of this chapter, Anaxagoras does not explicitly state the principle, nor does he provide an explicit justification for it. In absence of textual evidence, we can only speculate as to what motivates Anaxagoras to take this stance.<sup>7</sup> One possibility is that he simply believed that anything does indeed “come out” of anything in nature. But this need not be the only hypothesis, and there are others to consider. Anaxagoras might have been driven by criteria of metaphysical economy, on account of the universality and simplicity of the theory which **UE-P** expresses. If so, Anaxagoras’s motivation would be a methodological concern. It is also possible that he was aware that his metaphysical system did not have the resources for restricting extraction in some way, and this is why he “embraced” **UE-P**. If Anaxagoras had wanted to restrict the principle in some ways, he would have had to explain that  $x$  can derive from  $y$  but not from  $z$ , because  $x$  is in  $y$  but not in  $z$ . This would have required positing special relations of qualitative similarity or difference between things (e.g., holding between  $x$  and  $y$ , but not between  $x$  and  $z$ ). These special relations would

7. Anaxagoras’s principle of universal extraction has attracted much scholarly attention, and also speculation on what Anaxagoras’s motivations might have been. For instance, Brad Inwood remarks on the generality of the principle thus: “This is perhaps an unnecessarily sweeping generalization, since there are some emergences which do not occur, but it is *in keeping with Anaxagoras’ bold speculative temperament*” (1986: 28, my emphasis). More in line with the approach I take, Richard McKirhan remarks on the metaphysical economy of the principle and the difficulty of restricting it (1994: 211). Montgomery Furth offers an interesting review of how people have reacted to the principle, at least up to the publication date of his own article (1991: 109, n. 16).

have presupposed alternative accounts of the metaphysics of material objects, from the ground up, starting from the constitution of the primordial mixture and the role of *nous* in the universe.<sup>8</sup> We know that Anaxagoras's metaphysical system, where similarity is primitive, does not have the means to differentiate which restrictive derivations or transformations might be possible, and which not. Spatial movement and preponderance of the opposites<sup>9</sup> cannot explain special patterns of derivation. It is possible that Anaxagoras does not try to restrict the principle because he is aware of the limits of what his metaphysics can account for. We will examine in this and the next chapter how central **UE-P** is in Anaxagoras's metaphysics of nature and how it is put to use.

## 2.2. THE EVERYTHING-IN-EVERYTHING PRINCIPLE

The thrust of **UE-P** is that anything can “come out” of anything. On the other hand, Anaxagoras holds that what can come “out of” something must be already in it; this is due to the Parmenidean strictures in place in his system, as we saw in Chapter 1. We are now well positioned to see that from these commitments of Anaxagoras's, a theory of *extreme mixture* follows. Anaxagoras holds what is known as the *Everything-in-Everything Principle*, which says,

**EE-P:** There is a share of everything in everything.

This principle is explicitly stated and repeatedly mentioned in the extant texts, for instance in B1 (πάντων μὲν ἐν παντὶ ἐνόντων) and B6 (ἐν παντὶ πάντα). There are also two alternative formulations of the principle. One is in terms of all things *having a share* (μοῖρα) of

8. Such speculative alternative accounts would also violate the pivotal principle in Anaxagoras's metaphysics that there is a share of everything in everything.

9. The Preponderance Principle is examined below in section 2.4.

everything, for instance in B6 (πάντα παντὸς μοῖραν μετέχει); B11 (ἐν παντί παντὸς μοῖρα ἔνεστι πλην νοῦ); and B12 (ἐν παντί παντὸς μοῖρα ἔνεστι πλην νοῦ . . . τὰ μὲν ἄλλα παντὸς μοῖραν μετέχει). The other formulation is in terms of all things *being together*; see for instance B1 (πάντων ὁμοῦ ἐόντων) and B4b (πάντων ὁμοῦ ἐόντων). We will return to these variants of the formula in chapter 3. For now, there is a point to examine regarding Anaxagoras's statement of the principle in terms of which there is everything in everything (e.g., in B1 and B6). What "everything" refers to in each of its occurrences is a matter of controversy among scholars. Some hold that "everything" has the same referent in both occurrences; others, that the referent is not and cannot be the same. Accordingly, three possible readings have been offered in the literature: that (i) there is some of every compound in every compound; that (ii) there is some of every opposite in every compound; and that (iii) there is some of every opposite in every compound and in every opposite. Readings (i) and (ii) depend on taking "everything" to have the same referent in both occurrences,<sup>10</sup> and that is the reading I endorse; while on reading (iii) there are different referents in play. I will engage first with the arguments given for the reading alternative to mine, taking David Sedley's (2007) as representative of this view.

According to Sedley, the referent is not and cannot be the same in both occurrences—rather, the principle has to be read as saying that "every phenomenal thing, for example a horse or a rock, contains every opposite" (2007: 29); i.e., there is a share of every opposite in every phenomenal thing. Sedley rests his case on three sets of considerations. First, he notes that it is not uncommon in informal conversational contexts, in ancient Greek as well as in English, to find two occurrences of the word "everything" that are not coreferential—Anaxagoras might have stated his principle in just this (informal) way. Second, Sedley appeals to the fact that there

10. As W. K. C. Guthrie (1965: 284–85), for instance, does.

are six cases (among the eight times in total the principle appears in the extant texts)<sup>11</sup> in which Anaxagoras uses different words for what is mentioned in the first position and what in the second. From this Sedley concludes that two occurrences of “everything” were not “part and parcel” of the original formulation of the principle. Finally, Sedley calls attention to B11, where we read that “in everything there is a portion (μοῖρα), of everything, and in some there is *nous* too.” Now, we know from B12 (as we will discuss in chapter 5) that Anaxagoras thought that *nous* resides in human beings. If so, Sedley reasons, the first occurrence of “everything” in B11 must include living beings too, and refer more generally to compound beings (rather than opposites). But if so, Sedley concludes, “The ‘everything’ that is in every compound entity cannot itself be every compound entity, or Anaxagoras would be saying, nonsensically, that every compound being contains a portion of every compound being” (2007: 30).<sup>12</sup> (This corresponds to reading (i) on my classification here above.) The (indeed challenging) stance that Sedley wants to avoid attributing to Anaxagoras is not however avoided even on his own preferred reading of the principle, where the first “everything” refers to all the opposites and the second to compound beings. The reason is that compound beings are made of stuff, and stuff is made of opposites. So if all opposites are in compounds beings, and compound beings are made of opposites (which do not undergo any qualitative or substantial transformation), then by transitivity all opposites are in all opposites.

To fully understand the import of **EE-P**, I submit, we need to consider it in conjunction with the *inseparability* of everything from

11. One needs however to bear in mind that the frequency of occurrences can only be taken as relative to the small part of Anaxagoras’s work that has been transmitted (in a fragmentary and indirect way) to us.

12. Sedley considers a further hypothesis, which one might think provides an alternative to his own proposal, but which he finds flawed. Suppose that the two coreferential occurrences were to refer not to compounds, but to the opposites. Even in this case, the result would be, according to Sedley, nonsensical: every bit of hot would



everything, which Anaxagoras mentions, for instance, in B6 in connection with **EE-P**:

Since it is not possible that there is a least, it would not be possible that [anything] be separated, nor come to be by itself, but just as in the beginning, now too all things are together.

ὅτε τοῦλάχιστον μὴ ἔστιν εἶναι, οὐκ ἂν δύναίτο χωρισθῆναι, οὐδ' ἂν ἐφ' ἑαυτοῦ γενέσθαι, ἀλλ' ὅπως περ ἀρχὴν εἶναι καὶ νῦν πάντα ὁμοῦ.

We will come to the analysis of this argument in chapter 3, and see that the justification of inseparability through the unlimited smallness of everything requires us to view the mixture of everything with everything at the level of the opposites. In other words, it is all the opposites which are mixed with all the opposites. The nature of each opposite is pure, its constitution unmixed—but opposites exist only mixed with each other. On account of B6, we need to take the two occurrences of “everything” in Anaxagoras’s statement of **EE-P** to be coreferring and to have the opposites as their referent. These issues very briefly introduced here will be more fully examined in chapter 3. To conclude this section, the philosophical difficulties that Sedley sees arising from reading the **EE-P** with the two occurrences of “everything” as coreferential derive from the assumption of a particular interpretation of Anaxagoras’s theory of extreme mixture. They are not cogent reasons in absolute terms for denying the coreferentiality of the term “everything” in the relevant texts.

### 2.3. THE NO-LEAST AND NO-LARGEST PRINCIPLES

We have so far identified Anaxagoras’s commitment to account for change in the natural world within a Parmenidean philosophical

have in it some cold, some heavy, some sweet, some bright, etc. (2007: 29). I hold that “everything” refers to the same in both occurrences, namely to the opposites; but I interpret the way they are “in” everything in a new way in chapter 4.

framework, and the keystone to that account: a theory of extreme mixture. Anaxagoras posits a number of fundamental metaphysical principles that govern his theory, two of which we have already seen: the principle of universal extraction, **UE-P**, and the principle that there is a share of everything in everything, **E-E**. These two principles are complemented by an additional one concerning the extension of the magnitude that opposites may have. With this third principle, Anaxagoras removes, as it were, any upper and lower limit to the scale of the opposites' magnitude. He does so in a single line of text, leaving his thought in need of much explication. For the sake of clarity of exposition, I articulate here Anaxagoras's thought into two different but complementary principles, one concerning the lower limit and one for the upper limit of the opposites' magnitude. I call them the *No-Least Principle* and the *No-Largest Principle* respectively. The former may be formulated thus:

**No Least-P:** There is no lowest limit to the magnitude of the opposites.

Textual evidence to the effect that Anaxagoras endorses this principle is to be found, for instance, in B1 and B3. I will here briefly introduce the texts, and the difficulties that interpreters have encountered in attempting to derive a philosophically sound position from them.<sup>13</sup> In B3 Anaxagoras offers the example of the opposite small as something that exists in unlimitedly small shares: “Nor of the small is there a smallest, but always a smaller” (οὔτε γὰρ τοῦ μικροῦ ἐστὶ τό γε ἐλάχιστον, ἀλλ’ ἔλασσον αἶνι). He also gives a justification for why the endless division of something into smaller and smaller shares does *not* lead to nonbeing: “For what-is cannot not be” (τὸ γὰρ ἐὸν οὐκ ἔστι τὸ μὴ οὐκ εἶναι). This justification is in line with

13. Chapter 3 provides a sustained philosophical discussion of the significance of **No Least-P** in Anaxagoras's system and in the history of metaphysics at large, and chapter 4 a fuller review of the existing alternative interpretations and the difficulties that are left unsolved by them.

the Parmenidean views Anaxagoras endorses, as we saw in chapter 1.<sup>14</sup> In B1, when talking about the principle, Anaxagoras shows a flair for paradoxes—he says that each of the opposites, e.g., the hot, the dry, etc., is unlimitedly *large* in amount (πλήθος),<sup>15</sup> and unlimitedly *small*:

In the first book of the *Physics* he says at the beginning, “All things were together, unlimited both in amount and in smallness.”

δηλοῖ διὰ τοῦ πρώτου τῶν Φυσικῶν λέγων ἀπ’ ἀρχῆς· ὁμοῦ χρήματα  
πάντα ἦν, ἄπειρα καὶ πλήθος καὶ σμικρότητα.

What does Anaxagoras mean in claiming that the opposites are unlimitedly large in amount as well as unlimitedly small? The sense in which they are unlimitedly large is this: in the original cosmic mixture there is an unlimited number of kinds of elements and an unlimited amount of them, and the mixture itself is unlimited in extent. On the other hand, understanding in which sense they are unlimitedly small has proven very challenging to the interpreters since antiquity. There exist three main lines of interpretation in the literature, which will be reviewed and assessed in terms of their explanatory strengths and fit with the extant texts in chapter 4. To briefly anticipate that discussion here, interpreters are traditionally divided on whether the opposites are present in the extreme mixture of everything in everything as very small *particles*, or as very small *proportions* of each type of thing.<sup>16</sup> These are respectively labeled in the literature the “Particulate” and the

14. We will return to the analysis of fragment B3 in chapter 4; and also to the justification Anaxagoras gives for it, which will bring us to discuss the mutual influences between Anaxagoras and Zeno. Although the statement that there is no smallest of the small only indicates the indefinite extension of the magnitude of the opposite small, it is Anaxagoras’s use of this principle to derive ontological conclusions that is very innovative, as we will see in chapter 4.

15. On the difficulty of rendering πλήθος in English, and the different views different scholars have taken, see Curd (2010: 34); I here follow her translation and the general line of thinking.

16. Note that both interpretations presuppose that what is thoroughly mixed are *material* parts—rather than the fundamental opposites. In this connection, recall the discussion in chapter 1, sections 1.2 and 1.3.

“Proportionate” interpretations. On the first of the two, Anaxagoras is thinking of juxtaposed *particles* of stuff; on the other, he is thinking of *proportions* of stuff in a mixture.<sup>17</sup> On the Particulate interpretation, the material components of Anaxagoras’s ontology are present *as such* in the mixture, as material particles of finite size that are too small to be perceptually discerned, with the result being that they appear mixed. On the Proportionate interpretation, on the other hand, the total quantity of each type of material component is mixed together with the total quantities of the rest of the components, so that the totality is a uniform mixture through and through. So on the Proportionate interpretation the mixants exist in the mixture only potentially, not actually, like vanilla in a cake, or salt in seawater. Building on existing discussions in the literature, I will argue in chapter 4 that both ways of taking Anaxagoras’s claim that the opposites exist as unlimitedly small are prey to serious difficulties, both philosophically and/or textually.

There is one more philosophical point to highlight at this stage, before we move on to the *No-Largest Principle*. Let us return to Anaxagoras’s example for the **No Least-P**, that of the opposite small. When he claims that there is no smallest of the small, he is clearly referring to an instance of the small. It is important that he says that there is no smallest *of the small*. This entails that the divisions of the small are themselves instances of the small. This is so because the small is a homoeomer. The term “homoeomer” was introduced by Aristotle, as a “technical” one, that is, with a specific philosophical meaning.<sup>18</sup> Homoeomers are entities whose parts are of the same kind as the whole of which they are parts. Homoeomeric opposites,

17. Curd (2010, chapter 3) provides a helpful state-of-the-art account of the scholarly debate.

18. See Aristotle’s reading of Anaxagoras in *Physics* 203a19: “And as many as make the elements infinite, as Anaxagoras and Demokritos, the former out of homoeomers” (ὅσοι δ’ ἄπειρα ποιοῦσι τὰ στοιχεῖα, καθάπερ Ἀναξαγόρας καὶ Δημόκριτος, ὁ μὲν ἐκ τῶν ὁμοιομερῶν). Even if Anaxagoras himself did not use the term, nor have an explicit criterion of sameness of kind for the whole and its parts to identify homoeomers, it cannot be doubted that he could grasp the distinction between what is homoeomeric and what is not, on the basis of everyday life

and stuffs (such as wine, flesh, etc.), may be added and divided *salva qualitate*, we may say. By contrast, individuals (for instance a human being or a tree) may be divided in unlimitedly small parts, but unlimitedly small parts of an individual are not an individual of the same kind as the one they are parts of. For instance, the limb of a human being is not a human being.<sup>19</sup> So Anaxagorean opposites are homoeomers; for example, adding brightness to brightness, one gets more brightness, and subtracting gives less of it. Does small added to small make up small? Counterintuitive as it might seem, the answer is yes, it does, because adding opposites intensifies their quality, so adding small to small increases the smallness, making it smaller, and so, small. By extension, if all opposites are homoeomers, then just as any part of smallness is smallness, any part of heat will be heat, and so forth. From the **No Least-P** and the way Anaxagoras uses it to derive ontological conclusions, one can now draw two important considerations. The first is that Anaxagoras's universe is *atomless*, because its building blocks, the instantiated opposites, are infinitely partitioned into parts. The second consideration, which draws on the discussion carried out in chapter 1 as well as in this chapter, is that in Anaxagoras's universe *power is bottomless*. The parts of the endlessly divided opposites are *like the whole* of which they are parts. Any part of the small is small. But since the opposites are causal powers, it follows that powerfulness does not "give out" at any level of partitioning of a power. More on this in chapter 3. Before concluding this section, let us turn to the other principle complementing the **No Least-P**, which I called the *No-Largest Principle*, thus formulated:

**No Largest-P:** There is no upper limit to the magnitude of the opposites.

experience. For example, one learns from experience that adding wine to wine in a jug results in more wine, whereas adding an apple to an apple does not result in more apple, but in two apples.

19. Also, the seeds may be divided in unlimitedly small parts, but unlimitedly small parts of a seed are not seeds of the same kind, because seeds are primitively structured bundles of opposites, as we will see in chapter 5.

In B3 Anaxagoras says “of the large there is always a larger” (τοῦ μεγάλου αἰεί ἐστι μείζον), illustrating the principle with the example of the opposite large. We can understand this statement in analogy with the case of the unlimited smallness of the small. We know that Anaxagoras holds that the value at a location of an opposite can increase through preponderance (see section 2.4), making the opposite manifestly perceptible. But its perceptibility is not an upper limit of its possible increase in magnitude. In view of the unlimited quantities of each opposite in the universe, there is *no* limit to how high the value of each opposite can be. Thus, for Anaxagoras, the strengths or intensities of opposites can be unlimitedly small and unlimitedly large; this thought is captured by the *No-Least* and *No-Largest principles*.

A number of difficult questions at this stage remain open. I have already briefly mentioned two related ones. In positing that the opposites may have unlimitedly small and large magnitude, is Anaxagoras thinking of small and large magnitude with regard to the *size* of a volume, or the *intensity* of a power? Is it the volume that an instance of an opposite occupies that may be unlimitedly small or large in magnitude, or the strength of that instance of the opposite? If there is no limit of smallness or largeness as to how small or large something can be, then the size of the volume a trope occupies can be unlimitedly small or large. Similarly its strength or intensity may be unlimitedly small or large. This has universal application to all opposites—with respect to the volumes their tropes occupy and the intensities they have; the issue will be addressed in sections 2.4 and 2.5 of this chapter. Another related question is what the “presence” of an opposite is. Is it the volume a trope occupies, or its intensity? What we learned so far does not yet enable us to answer the question. We have seen that the fundamental mechanism of the increase and decrease of the presence of an opposite at a location is the spatial movement of that opposite (by the cosmic vortex initiated by *nous*). Movement can cause the separation of an opposite from the mixture at a location, and it can also cause the preponderance of an opposite at a location. That this is Anaxagoras’s view is known,

for instance, from B12 (to which we will return also in the next section of this chapter). Clearly the movement of an opposite in space determines its presence in specific locations in space, but the nature of its presence requires more investigation, which will be postponed to chapter 3.

## 2.4. THE PREPONDERANCE PRINCIPLE: THE MECHANISM OF PREPONDERANCE

It is an everyday observation that things in the world are different in character, and that, by and large, they also change at different stages of their life span. What can explain this natural phenomenon in a world like Anaxagoras's? On the one hand, no generation, destruction or qualitative alteration is possible in his world, because of the Parmenidean strictures in place in the system. On the other, everything has the same origin (the primordial mixture) and the same type of constituents (the opposites). Anaxagoras's reply might seem (misleadingly) simple:<sup>20</sup> in a world where everything is a mixture of everything, things are different on account of the ingredient(s) that predominate in each. This is known in the literature as the *Preponderance Principle*:

**P-P:** A thing is *f* if and only if the opposite *f* is preponderant in that thing's constitution (in relation to other opposites also present in the thing).

**P-P** is posited to explain why things are qualified by certain attributes (for instance, hot), but also why things are of a certain kind (for instance, earth). In B1: "all things being in everything, but each being characterized by what predominates" (πάντων μὲν ἐν παντί ἐνόντων,

20. We will see, in chapter 3 especially, that in fact the metaphysics underpinning it is very sophisticated.

ἐκάστου δὲ κατὰ τὸ ἐπικρατοῦν χαρακτηριζομένου).<sup>21</sup> Elsewhere also, in B12 being preponderant is expressed in terms of being “the most” (πλείστος) in a bundle of opposites:

Nothing else is like anything else, but each one is and was most manifestly those things of which there are the most in it.

ἕτερον δὲ οὐδὲν ἐστὶν ὅμοιον οὐδενί, ἀλλ’ ὅτῳ πλεῖστα ἐνι, ταῦτα ἐνδηλότατα ἐν ἑκάστῳ ἐστι καὶ ἦν.

How does an opposite achieve preponderance at a location? What is the mechanism for preponderance? Is Anaxagoras thinking about preponderance in *quantity* or in *intensity* of one (or more) opposite(s) in a bundle? Is a bundle hot because there are mostly shares of hot in it, or because the share(s) of hot in it are simply very hot? Both interpretations of **P-P**, as referring to quantitative preponderance or higher intensity, are consistent with Anaxagoras’s other metaphysical commitments, but one is preferable on textual grounds, and that is the *quantitative preponderance* interpretation. I submit that, on the more natural reading of the Greek and by analogy with the majority of the occurrences of this term in the extant texts of Anaxagoras’s, the key word πλείστος, which occurs in the statement of **P-P** in B12, indicates quantitative preponderance. Additionally, the term μικρός that Anaxagoras uses in B3 is naturally read as meaning little in size, or amount, or quantity, rather than low strength or intensity.<sup>22</sup> To bring the Anaxagorean conception of the preponderance of powers closer to everyday experience with a simile, one can think of the instances of a type of power as light bulbs—the more bulbs there are at a location the more light they produce; however, his powers come in infinitesimally small

21. As we have already touched upon, Anaxagoras relativizes preponderance to perceptibility. To this question we will return again.

22. A very different reading from mine of the term μικρός is offered by Inwood (1986) and Furth (1991) among others; I discuss the resulting alternative interpretation in chapter 4.



“bulbs” of powerfulness, so varying their quantity can scale up and down the whole range of power strength.

Before moving forward to investigate the significance of **P-P** as understood as referring to quantitative preponderance, let us here briefly consider the alternative reading of the principle in terms of preponderance in intensity. I pursue this line of thinking here, even if it is less well supported by the textual evidence, because I believe that by exploring it, we can gain a deeper understanding of what is philosophically possible in a system such as Anaxagoras’s. Suppose, per hypothesis, that *πλείστος* indicates a higher degree of intensity of one (or more) opposite(s) in the bundle. If so, what would make an opposite most manifest in a thing would be the strength of its intensity. How could an opposite be greatest in intensity in a bundle, when it is being compared to opposites of different kinds? The scale of strength of each kind of opposite is peculiar to the kind, and different from the scales of each other kind; thus the intensity of hardness is different from the intensity of wetness or the intensity of sweetness, etc. Now, it is possible that Anaxagoras thought of the preponderance of an opposite only in relation to its own opposite; in this case heat, for instance, would be manifest when more intense in an object than the cold. However, the lines of B12 quoted above where **P-P** is stated are more naturally read as referring to the preponderance of one (or more) opposite(s) in a bundle over *all* the other opposites present in the bundle. One might think that Anaxagoras held that for the intensities of all the opposites, the point of comparison, i.e., the threshold above which they become manifest, is their respective level of intensity in the original cosmic mixture. Anaxagoras does say, for instance in B4b, that the cosmic mixture was an indistinct mass, with the mixants “obscuring” one another:

Before there was separation off, because all things were together, there was not even any colour evident; for the mixture of all things prevented it.

πρὶν δὲ ἀποκριθῆναι [ταῦτα] πάντων ὁμοῦ ἐόντων οὐδὲ χροιοῦ ἔνδηλος ἦν οὐδεμία· ἀπεκώλυε γὰρ ἡ σύμμιξις ἀπάντων χηρημάτων.

On this possible line of thinking one could take the state of the opposites in the cosmic mixture as a kind of zero-sum, where none of the opposites “stands out” in comparison to the others. So if *πλείστος* meant “of greatest intensity,” the intensity of the predominant opposite in a bundle would be greater than its intensity in the primordial cosmic mixture, which was such that it left the opposite “obscured,” i.e., nonmanifest, in the mixture with all the other ones. In conclusion, it is possible to develop a reading of **P-P** in terms of preponderance in intensity, rather than quantity, of an opposite in the bundle. This alternative is consistent with what Anaxagoras says elsewhere concerning his metaphysical system. However, I take this reading as less preferable to the quantitative preponderance one, which is also consistent with Anaxagoras’s claims and is better grounded in the extant texts.

We turn now to examine the significance of **P-P** within the larger metaphysical picture we are canvassing on the basis of Anaxagoras’s claims. There are two issues to be teased apart: one is the mechanism of predominance, and the other is the outcome of predominance. By the former I mean the question of how predominance comes about in Anaxagoras’s system. We saw that according to **P-P**, if an opposite is preponderant in relation to the other opposites in a bundle (or region in space), it is most manifest there (recall *ἐνδηλότατα* in B12), i.e., it is perceptually evident, and the bundle appears of a kind to us, e.g., hot, rough, yellow etc. That is, when an opposite is preponderant, or when it comes to be preponderant in a bundle, it characterizes the bundle, contributing to its profile of perceptible properties. Of course an opposite can be preponderant in relation to other opposites without reaching the human perceptibility threshold—there could be *imperceptible preponderance*.<sup>23</sup> Anaxagoras gives no indication

23. The perceptibility of the opposite does not itself settle the question just considered of whether what makes the opposite preponderant is the *quantitative abundance* of the opposite or the *higher intensity* of the opposite over the others. Either of these two cases could have a perceptibility threshold that would explain that an opposite is considered preponderant if and only if perceptible.

of being interested in such levels of preponderance that are not perceptible to humans—thus showing his ontology to be developed “from within” the perspective of humans or more generally, sentient organisms. On account of this, in what follows I will talk of composition *modulo* perception, to indicate that the relevant opposites for the composition in question are the perceptibly preponderant ones. The criterion of composition *modulo* perception applies in two ways in any composition of opposites into some thing. It determines which opposites are relevant constituents of the bundle, i.e., the opposites that are perceptually manifest; and it also applies to the thing composed, in the sense that such thing is perceptually composed. Thus, a combination of preponderant (*modulo* perception) opposites, such as “the dense and the wet and the cold and the dark,” can compose (*modulo* perception) into a type of thing such as earth. In such a case, earth is preponderant in that region.<sup>24</sup> This is what B15, for instance tells us: “The dense and the wet and the cold and the dark came together here, he says, where <the> earth is now” (τὸ μὲν πυκνόν, φησί, καὶ διερόν καὶ ψυχρόν καὶ τὸ ζοφερόν ἐνθάδε συνεχώρησεν, ἔνθα νῦν <ή> γῆ).

Before concluding this section, there is a final issue that we need to address, arising from the extant texts, and concerning composition *modulo* perception. It may come as a surprise to the reader that Anaxagoras also allows the possibility that something that is composed *modulo* perception may be imperceptible. Importantly, this is a different case from the one of imperceptible preponderance. When something is composed *modulo* perception, the relevant opposites that make it the type of thing it is (e.g., for earth the dense, the wet, the cold, and the dark) are compresent and compreponderant in it.

24. As Eric Lewis among others has noted (2000: 3, n. 7), **P-P** presupposes that kinds have some sort of compositional plasticity, in the sense that there is no fixed threshold the opposites have to reach for earth to be; predominance (*modulo* perception) over the other opposites is sufficient. The thought is exemplified by Schofield thus: “Water for example is in essence nothing but stuff in which the dense, the wet, the cold and the murky predominate—to a *greater extent* than they do in clouds, but *less than* in earth or stones” (1980: 116, my emphasis).

So it appears that a type of thing is present, earth, over and above the opposites, because we perceive it there. Fragment B4b *prima facie* challenges this thought, because it mentions that there was earth in the primordial cosmic mixture and yet it was imperceptible, because no features were discernible in the mixture.<sup>25</sup>

Because all things were together, there was not even any colour evident; for the mixture of all things prevented it, of the wet and the dry and of the hot and the cold and of the bright and the dark, and *there was much earth* present and seeds unlimited in number, in no way similar to one another. (My emphasis)

πρὶν δὲ ἀποκριθῆναι [ταῦτα] πάντων ὁμοῦ ἐόντων οὐδὲ χροιοῦ ἔνδηλος ἦν οὐδεμία· ἀπεκάλυε γὰρ ἡ σύμμιξις ἀπάντων χρημάτων, τοῦ τε διεροῦ καὶ τοῦ ξηροῦ καὶ τοῦ θερμοῦ καὶ τοῦ ψυχροῦ καὶ τοῦ λαμπροῦ καὶ τοῦ ζοφεροῦ, καὶ γῆς πολλῆς ἐνεούσης καὶ σπερμάτων ἀπείρων πληθος οὐδὲν ὁμοίων ἀλλήλοις.

How are we to understand this case? There is a way: we can imagine physically dividing up the lump of earth existing in the cosmic mixture into smaller and smaller lumps or parcels (which nevertheless retain the same compositional ratio of the ingredient opposites, as per B15). Then, eventually, with this process of division we reach lumps of earth that are so small as to be individually imperceptible (especially when mixed with many other things as well). These small lumps are still earth, although they are too small to be seen. This explains what is said in B4b without committing Anaxagoras to any inconsistency, and sits well with what he says in B1: “And because all things were together, nothing was evident on account of smallness” (καὶ πάντων ὁμοῦ ἐόντων οὐδὲν ἔνδηλον ἦν ὑπὸ σμικρότητος·). In conclusion, although it is surprising that Anaxagoras includes earth as existing as such in the primordial mixture and yet being

25. Even if earth come to be only in the second phase of the generation of the cosmos (see section 1.1 in chapter 1), it is still mixed and imperceptible.

imperceptible (which is surprising because earth is composed at a perceptual level), nevertheless we can supply a way of understanding Anaxagoras's claim in B4b.<sup>26</sup>

Recall now that, as we saw in chapter 1, section 1.6, Graham (2004) objects to interpreting the opposites as powers, on the ground that this interpretation does not allow for quantitative preponderance.<sup>27</sup> The powers interpretation I developed does explain preponderance quantitatively (and not qualitatively), since the key to preponderance is *increase in density*, which requires *more instances* of the same kind in the same region of space. Material stuff increases in density when more matter accumulates in the same region. Powers increase in density when *more power* accumulates in the same region. More matter of the same kind in the same region is heavier, while more power of the same kind in the same region is more powerful, i.e., stronger in intensity; both are additive within a region. In sum, *quantitative* preponderance can be explicated in terms of increase in *density*, which results in an increase in *intensity*.

To conclude, this section introduced **P-P**, and dealt primarily with the issue of whether preponderance has to be understood in terms of quantity or intensity. Further, it examined the connection between preponderance and perceptibility and a potential challenge to Anaxagoras's theory as sketched so far, namely that there can be something like earth where the relevant opposites predominate and yet the bundle they make up is imperceptible. Having clarified all these interpretative issues, we are now well placed for investigating the question of what the outcome of predominance is.

## 2.5. THE OUTCOME OF PREPONDERANCE

Before moving forward, let us briefly draw together the conclusions reached so far in this chapter. Anaxagoras's opposites are

26. I take earth to be just an arbitrary placeholder for any and every type of stuff.

27. Graham writes that "advocates of the Tannery-Burnet thesis need to turn **P** [that is, my **PP**] into a qualitative, not a quantitative principle" (2004: 15–16).

everywhere, in unlimitedly small shares,<sup>28</sup> being of primitively different kinds. Accumulation of the shares of an opposite in some region of space makes that opposite perceptible as a characteristic of that region (e.g., hot). If various opposites become preponderant, and hence manifest in some region, they may be perceived as composing a kind of stuff, such as earth. (This is their constitutional-causal role.) Furthermore, all opposites are present in every thing, but individual things are qualitative differentiated by some opposites, in virtue of being preponderant in them; this is their qualitative-causal role. It is timely now to address the question of *how* Anaxagoras thinks an opposite affects the constitution and the qualitative profile of the thing it is in, by coming to be preponderant in it. This is the issue of the outcome of preponderance. Is it, for instance, that when the large becomes preponderant in something, that thing becomes larger by being augmented through the acquisition of more and more shares of the large? If this were the mechanism, how could something have *more shares* of the opposite small, and yet become, not bigger, but *smaller* the more shares of the small it has? The option that something becomes smaller by *losing* shares of the small is not open to Anaxagoras, since he needs an account that works for *all* opposites, not just for the small. Intuitively, something cannot become bigger by losing shares of the large. On the other hand, it seems *prima facie* paradoxical to say that something becomes smaller by *acquiring more* of the small, that is by augmenting the quantity of shares of the small it has. We have already Anaxagoras's flair for paradoxes, and it surfaces here again when Anaxagoras, as we will see, actually says that the small becomes smaller by acquiring shares of the small; but the meaning of this claim will need to be carefully examined. What is the way forward?

Notwithstanding the *prima facie* paradoxical difficulties that the principle generates when applied to the opposite small, the only general metaphysical mechanism available in Anaxagoras's system is

28. As we will see in chapter 3, the shares exist primitively as unlimitedly small; they are not the result of a process of division.

quantitative accumulation of the shares, as per **P-P**, as we saw in the preceding section. What then does *more of* the opposite “do” for the compound it is in? That is, what is the outcome of the predominance of an opposite in a compound? We know that the shares of the opposites are located in space. The movement of the shares of opposites can result, according to Anaxagoras, in the accumulation (or depletion) of the shares in particular regions of space. But is the outcome of the accumulation of an opposite at a location an increase in the *size* of the volume the opposite occupies at that location, or an increase in the *intensity* of the opposite there? For example, a spot of green on a canvas may be imperceptible due to its smallness, though many such spots together would be perceptible. Alternatively, increasing the intensity of the color green at that spot could make the spot of green perceptible. Note that here we are not discussing (again) the issue of whether the *mechanism* that leads to the preponderance of an opposite in a bundle is to be understood as increasing the intensity or the quantity of an opposite in a bundle. The focus now is on the *outcome* of preponderance. Anaxagoras does not give us any explicit account of it, so we can only attempt to derive his position from the extant textual evidence. I submit that what preponderance achieves is *intensifying* an opposite at a location. The reason why this must be the position Anaxagoras holds is that we know that for him all opposites are already in everything. The size of the volume they occupy cannot become larger. This is why they can only intensify, so that, e.g., the cold becomes colder.

An additional argument for the same conclusion that the outcome of preponderance is the increase in an opposite’s intensity may be given along the following lines. Assuming that increase of volume or in intensity are the only two possible outcomes of preponderance, if there are reasons why increase of volume is not a way forward, this indirectly supports the other alternative—the increase in intensity. Anaxagoras does make this sort of claim, as in B1: “Nothing was evident [in the primordial mixture] on account of smallness” (οὐδὲν ἔνδηλον ἦν ὑπὸ σμικρότητος). This suggests that it is the smallness

in size of the volume of an opposite at a location that determines its perceptibility. But when we look at Anaxagoras's often-used example of the opposite small, accumulation of more shares of the small at a location cannot be taken to increase the volume of the thing becoming smaller. More of the small means greater smallness, and hence a smaller object. Hence, by generalization, the accumulation of an opposite at a location is increase in degree of that opposite, and hence, intensification of the opposite at a location.<sup>29</sup>

We are now in the position to reconsider the more general question: how is the volume of each share of an opposite related to the degree of intensity of the opposite? Can the quantity of the opposite and its strength or intensity at a location vary independently of one another in Anaxagoras's system?<sup>30</sup> This question has already come up in different guises in this chapter, in our examination of both the mechanism of preponderance and the outcome of preponderance. We can now give it a conclusive answer. Opposites come to predominate at a location (in a bundle) by quantitative accumulation, and their intensity (and perceptibility) results from how much of an opposite there is at a given location (and how the intensities of the shares combine depends on how quantities of shares combine). Accounting for the outcome of preponderance of an opposite in terms of its increased intensity in a bundle is Anaxagoras's solution to the problem of how **P-P** can generalize to include also the case of the

29. This is the reason why Anaxagoras does not face the paradox that Plato raised in the *Phaedo*, of how the *addition* of the small could result in the thing becoming *smaller*. In Plato's words: "Well, suppose one of us going to have a part of the small. The small will be larger than that part of it, since the part is a part of it: so the small itself will be larger! And that to which the part subtracted is added will be smaller, not larger, than it was before.'—'That surely couldn't happen,' he said" (Ἀλλὰ τοῦ μικροῦ μέρος τις ἡμῶν ἔξει, τούτου δὲ αὐτοῦ τὸ μικρὸν μείζον ἔσται ἅτε μέρους ἑαυτοῦ ὄντος, καὶ οὕτω δὴ αὐτὸ τὸ μικρὸν μείζον ἔσται· ὃ δ' ἂν προστεθῇ τὸ ἀφαιρεθὲν, τοῦτο μικρότερον ἔσται ἀλλ' οὐ μείζον ἢ πρὶν. Οὐκ ἂν γένοιτο, φάναι, τοῦτό γε. Τίνα οὖν τρόπον, εἰπεῖν (131d).

30. If they varied independently, there would be a double mereology in play in Anaxagoras's system—a mereology of the size of the shares of opposites, and a mereology of the degrees of the shares of the opposites. As I have argued in this chapter,



opposite small. As we have seen, something small becomes smaller by quantitative accumulation of shares of the small. Anaxagoras avoids absurdity here by positing that the result of accumulation of shares of an opposite is the intensification of that opposite in the bundle.<sup>31</sup> So, although the mechanism for the increase or diminution of the effect of an opposite on the constitution of a thing is the accumulation of shares or tropes of the opposite, this results in a corresponding increase or diminution of its strength or intensity, and hence, its perceptibility.

We can now return, with the benefit of the preceding discussion, to the topic of the causal efficacy of the opposites introduced in chapter 1. The examination of **P-P**, which governs the intensification of an opposite at a location, gives us a new angle for understanding of how the opposites can be causally efficacious. Anaxagoras says that, in the original mixture, “before there was separation off, because all things were together there was not even any colour present” (B4b), the reason why there was no color present being that everything was mixed together. Without any preponderant opposites, the primordial mixture is a mass of no distinct character or nature. We should observe that this primordial featurelessness is the *causal outcome* of the compresence of all the opposites in it, without any one predominating over the others, because they are all equal in amount and mixed together. Thus, the nonpreponderance of opposites too is causally efficacious, in the sense that it is responsible for

this is not Anaxagoras’s position. Another possibility in principle open to Anaxagoras would have been to posit shares of opposites that are primitively of different intensities. But there is no indication of this way of thinking in the extant texts. Instead, all variations of intensity of an opposite are explained in terms of the varying numbers of shares of the opposite at a location, and hence varying densities of shares of that opposite at that location. As we have seen, in Anaxagoras’s ontology, the shares of the opposites are unlimitedly small in size and so, if intensity follows quantity, they are each unlimitedly small in the degree of intensity.

31. In the *Phaedo* Plato dismisses the explanation that “the greater man is greater by a head, which is small, and [explains] that it is a monstrous thing that one is great by something that is small” (ἔπειτα τῇ κεφαλῇ μικρὰ οὖση τὸν μείζω μείζω εἶναι, καὶ τοῦτο δὴ τέρας εἶναι, τὸ μικρῶ τινὶ μέγαν τινὰ εἶναι) (101b).

the featurelessness of the mixture. There are therefore two different ways in which opposites are causally efficacious through their presence: by preponderance and by nonpreponderance.

Some interpreters have found problematic the idea that according to **P-P** the opposites make things be of such and such a character simply by being part of the very constitution of these things. A recent example is John Palmer (2009), who believes that if the domain of application of the principle is not somehow restricted, Anaxagoras is committed to an absurd position. It is important to consider this worry. Palmer writes,

Some restriction of the postulate appears necessary to forestall absurdity. Anaxagoras can hardly have meant to analyse all characteristics or properties in terms of the preponderance of stuffs in their subjects' constitution. It would be clearly absurd, for instance, to try to account in this way for relational properties such as being to the left of. . . . Smallness and largeness are properties of things, not things within them. (2009: 236–37)

I submit that Palmer's argument can be addressed on behalf of Anaxagoras. Palmer considers two groups of properties of things that if accounted for by **P-P** would generate absurd results. Such (presumed) absurdities are intended to raise questions about how broad the domain of application of **P-P** can be, and whether Anaxagoras was aware of the need to narrow it. The two group of properties Palmer appeals to are on the one hand relational properties, such being to the left of *a*, and on the other the properties of being small and large. With respect to the first group, one might want to turn the tables and ask Palmer: why would Anaxagoras want to treat these properties that are *external* to the constitution of things *as if* they were part of the constitution of things? Why would one expect Anaxagoras to set out to do so? On the other hand, in Palmer's favor, since external relations had not been identified as such in metaphysics yet, it is plausible that Anaxagoras would not have thought that such properties require a different analysis, or that they constitute

a separate category of their own, outside the domain of application of **P-P**. Let us assume for argument's sake that Anaxagoras included them within **P-P**'s domain of application. Would it have been absurd, as Palmer claims, to address their metaphysics in terms of the constitution of the things that are externally related to? Plato, for instance, who does consider external relations and admits them in his ontology, interestingly provides a constitutional account for them in terms of the Theory of Forms. We see this, for instance, when Plato explains, metaphysically, Socrates and Hippias being two, although each of them is only one, in terms of their constitution—namely, in terms of their joint partaking of the Form of Two.<sup>32</sup> So either we need to charge Plato too of absurdity for having given such account of external relations, or the charge should not apply to Anaxagoras for having taken that approach. What about smallness and largeness? Would it be absurd to think of them as “things” within small and large things, as Palmer thinks it would be? Again, there is ample textual evidence that Plato tried to explain smallness and largeness in terms of small and large things participating, respectively, in the Forms of the Small and the Large. He even considered literal participation, in the *Parmenides*, and examined the metaphysical consequences of explaining largeness or smallness by parts of largeness and smallness in participating things.<sup>33</sup> Further, Plato analyzed comparative relations, such as being larger or smaller, in terms of participation in the Large and the Small in the *Phaedo*.<sup>34</sup> Comparative

32. See *Hippias Major*, 300d7–301e5 and the relevant discussion in Scaltsas (2016).

33. See *Parmenides* 130e–131a: “But tell me this: is it your view that, as you say, there are certain forms from which these other things, by getting a share of them, derive their names—as, for instance, they come to be like by getting a share of likeness, large by getting a share of largeness, and just and beautiful by getting a share of justice and beauty?” “It certainly is,” Socrates replied.

34. See *Phaedo* 71a: “Then if something smaller comes to be, it will come from something larger before, which became smaller? That is so, he said. And the weaker comes to be from the stronger, and the swifter from the slower? Certainly. Further, if something worse comes to be, does it not come from the better, and the juster from the more unjust? Of course.”

relations are particularly interesting, metaphysically, because they can be either external relations to a thing, or result from changes in the thing's own constitution, e.g., when *a* becomes larger than *b* by an increase in *a*'s size. So assuming at the very least that Plato's approach to these metaphysical issues was not absurd, there is no reason to charge Anaxagoras of absurdity, given that he adopted the same approach as Plato.

## 2.6. CLOSING REMARKS

This chapter introduced Anaxagoras's theory of extreme mixture, which is his solution to the question of how observable changes in nature can be accounted for in a world governed by Parmenidean principles. There are three pillars to Anaxagoras's theory: in his system, (i) anything can "come out" from anything, (ii) there is a share of everything in everything, and (iii) things are qualified by the opposite(s) predominant in them. The last principle is posited to explain why things are qualified by certain attributes (for instance, hot), but also why things are a certain kind (for instance, earth). These three principles raise interpretative and philosophical difficulties, which have been examined in this chapter, yet they are all sound, and with each of them Anaxagoras breaks new ground in metaphysics. Their philosophical significance will be explored in the following chapters. Chapter 3 will introduce and offer arguments for the fresh interpretation that I want to motivate of the principle that there is a share of everything in everything. Chapter 4 will provide further support for my interpretation, by discussing alternative ways of understanding the principle and the unresolved difficulties they suffer from.

## A Theory of Extreme Mixture

In the preceding chapters we established that Anaxagoras develops an ontology where the opposites (such as the cold, the dark, the dry, etc.) are the fundamental elements, and we introduced some of the key principles governing this ontology. In this chapter I will argue that from such opposites and such principles,<sup>1</sup> Anaxagoras derives everything else there is in the universe by means of a unique mereology.<sup>2</sup> His mereology is unique in that on the one hand it allows for an *actual* infinite partitioning of what there is, and on the other it divides and combines *parts of instantiated properties*, the opposites, rather than parts of material objects. How can these two tenets be combined into one theory? We saw that in Anaxagoras's system, the shares resulting from the division of an opposite are uniform: they are homoeomerous according to the conception of homoeomerity that Aristotle attributes to Anaxagoras (see chapter 1). Each part of the instantiated property hot is itself an instance of the property hot, as each part of the small is small, etc. In other words, partitioning an element does not change its kind. For any given instantiated property, there is no smallest part of its instances, and given any part of an instance, there is a smaller, proper part of it.<sup>3</sup> This is metaphysically significant: powers remain powerful at any level of division.

1. With the addition of the seeds and *nous*, which are also powers; see chapter 5.

2. In chapter 6 we will investigate the closest variant of this mereology in the history of metaphysics—that of the Stoics.

3. Equivalently, we could express this as a statement about the intensity of the instances of the opposite.

This chapter will engage with the main tenets of Anaxagoras's power mereology and examine (or reconstruct where needed) the arguments that back them up. The resulting picture is of a universe whose building blocks, the opposites, each divide into *unlimitedly many, unlimitedly small* parts or instances.<sup>4</sup> All the instances of an opposite together amount to an unlimitedly large totality, though each of these instances is unlimitedly small.<sup>5</sup> How are we to understand this ontology? How can we model it metaphysically? I submit that this atomless system is an *ante litteram*, and yet an explicit description of what we modern philosophers call *gunk*.<sup>6</sup> For Anaxagoras, gunk is what underpins the world of our experience.

I will argue in this chapter that modeling the extreme mixture of all opposites in terms of hunks of gunk all *compresent* with each other offers us a philosophically sound and textually supported interpretation of Anaxagoras's key principle that there is a share of everything in everything. In offering this argument, I make a radical departure from the existing accounts in the literature of Anaxagoras's thought. My contention is that Anaxagoras's extreme mixture cannot be understood in terms of the *constitutional containment* of everything in everything, which has been the dominant line of interpretation of Anaxagoras's ontology thus far. Rather, his mixture needs to be explained in terms of the *necessary compresence* of everything with everything. For Anaxagoras there is a share of everything *with* everything, rather than a share of everything

4. Such parts of powers, which are infinite in number, exist as *necessarily coinstantiated* with each other, in an extreme mixture of everything with everything. Yet, as we saw in chapter 2, there can be different concentrations of them in different spatial regions of the universe, giving rise to stuffs and organisms (which require seeds too).

5. That the unlimitedly many, unlimitedly small instances of each element add up to an unlimitedly large element echoes, or at least matches, Zeno of Elea's paradoxes, where infinite divisibility is taken to add up to endless tasks.

6. The word "gunk" does not appear in Anaxagoras's or any other ancient philosophical texts, but this is no reason to think that we cannot use the expression, as defined by David Lewis (1991: 20), as characterizing something whose proper parts have proper parts. I will provide a definition of Anaxagorean gunk in section 3.2.

contained *in* everything.<sup>7</sup> Two strands of argument support the shift I want to bring about in our understanding of Anaxagoras’s pivotal tenet: the “positive” argument is built on the textual evidence and the explanatory power of the interpretation I propose in relation to the texts we have, and the “negative” argument concerns the shortcomings of the alternative interpretations (examined in chapter 4).

### 3.1. THE INSEPARABILITY OF ALL OPPOSITES

My starting point in this chapter is Anaxagoras’s explicit statement that the fundamental elements in his ontology are necessarily com-present with each other. We read, for instance, in B6:

Since it is not possible that there is a least, it would not be possible that [anything] be separated nor come to be by itself, but just as in the beginning, now too all things are together.

ὅτε τοῦλάχιστον μὴ ἔστιν εἶναι, οὐκ ἂν δύναίτο χωρισθῆναι, οὐδ’ ἂν ἐφ’ ἑαυτοῦ γενέσθαι, ἀλλ’ ὅπως περ ἀρχὴν εἶναι αἰ καὶ νῦν πάντα ὁμοῦ.

These lines are crucial for our understanding of Anaxagoras’s views. In them we find explicitly stated **NoLeast-P**, which serves as the main premise from which Anaxagoras derives the necessary inseparability of the opposites. The latter can be expressed in the following principle, **NoSep-P**:

**NoSep-P:** No instance of an opposite can occur distinctly, by itself (but is always together with instance[s] of opposite[s]).

7. An important feature of the interpretation I want to motivate is that for Anaxagoras there are pure kinds of opposites, even if their instances are inseparable and thus there is extreme mixture of everything in everything, as I will argue in this and the next chapter.

This principle, I submit, is of great metaphysical significance in Anaxagoras's system, though no argument has been preserved in full in the extant fragments to show *how* Anaxagoras establishes it, by deriving it from **NoLeast-P**. We can only try to reconstruct his line of thinking on the basis of the information we have about his ontology. I submit that the existing evidence allows us to speculate that Anaxagoras developed two distinct arguments for the inseparability of the opposites on the basis of **NoLeast-P**. The first one is flawed and was criticized already in antiquity by Aristotle as reported by Simplicius. Only the second one leads to Anaxagoras's desired conclusion of the necessary inseparability of all opposites (and ultimately their extreme mixture); but both arguments reveal to us important aspects of Anaxagoras's thought. I call the two arguments (*a*) from the Relativity of Opposites, and (*b*) from the Unlimited Smallness of the Quality Tropes, and I introduce them here in turn.

### 3.1.1. The Argument from the Relativity of Opposites

In this subsection I reconstruct how Anaxagoras can use **NoLeast-P** to successfully derive the inseparability of opposites *within a pair* (for instance, hot from cold, or large from small). On the other hand I also show that this application of **NoLeast-P** cannot be extended to deliver the more general conclusion that *all opposites* are inseparable. My reconstruction of Anaxagoras's argument draws on B3 and B8.<sup>8</sup>

8. I here quote B3 and B8 in full for ease of reference for the reader:

B3: For in fact Anaxagoras says directly at the beginning of the book that [the ingredients] were unlimited: "all things were together, unlimited both in amount and in smallness" [b1], and that there is neither a smallest nor a largest among the first principles: "Nor of the small is there a smallest, but always a smaller (for what-is cannot not be)—but also of the large there is always a larger. And [the large] is equal to the small in extent, but in relation to itself each thing is both large and small." For if everything is in everything and if everything is separated off from everything, then from what seems to be the smallest something yet



In B8 we find the thesis of the inseparability of all opposites illustrated with the example of the pair of opposites hot and cold:

The things in the one *kosmos* have not been separated from one another, nor hacked apart with an axe—neither the hot from the cold nor the cold from the hot.

οὐ κεχώρισται ἀλλήλων τὰ ἐν τῷ ἐνὶ κόσμῳ οὐδὲ ἀποκέκοπται πελέκει οὔτε τὸ θερμὸν ἀπὸ τοῦ ψυχροῦ οὔτε τὸ ψυχρὸν ἀπὸ τοῦ θερμοῦ...

Anaxagoras does not offer (in B8 or anywhere else in the extant fragments) an argument why the hot and the cold are inseparable from each other, but one can be constructed on the basis of B3, where the example used is that of the pair of opposites small and

smaller than that will be separated off, and what seems to be the largest was separated off from something larger than itself.

καὶ γὰρ ὅτι ἀπειρα ἦν, εὐθὺς ἀρχόμενος λέγει “ὁμοῦ πάντα χρήματα ἦν ἀπειρα καὶ πλῆθος καὶ σμικρότητα.” καὶ ὅτι οὔτε τὸ ἐλάχιστόν ἐστιν ἐν ταῖς ἀρχαῖς οὔτε τὸ μέγιστον, οὔτε γὰρ τοῦ σμικροῦ, φησίν, ἐστὶ τὸ γε ἐλάχιστον, ἀλλ’ ἔλασσον αἰεὶ (τὸ γὰρ ἐὸν οὐκ ἐστὶ τὸ μὴ οὐκ εἶναι),—ἀλλὰ καὶ τοῦ μεγάλου αἰεὶ ἐστὶ μείζον. καὶ ἴσον ἐστὶ τῷ σμικρῷ πλῆθος, πρὸς ἑαυτὸ δὲ ἑκαστόν ἐστι καὶ μέγα καὶ σμικρόν. εἰ γὰρ πᾶν ἐν παντὶ καὶ πᾶν ἐκ παντὸς ἐκκρίνεται, καὶ ἀπὸ τοῦ ἐλαχίστου δοκοῦντος ἐκκριθήσεται τι ἔλασσον ἐκείνου, καὶ τὸ μέγιστον δοκοῦν ἀπὸ τίνος ἐξεκρίθη ἑαυτοῦ μείζονος.

B8: When Anaxagoras says “nothing is dissociated or separated off one from another” [B12] because all things are in all things, and elsewhere: “The things in the one *kosmos* have not been separated from another, nor hacked apart with an axe—neither the hot from the cold nor the cold from the hot” (for there is not anything pure by itself), this, Aristotle says, is stated without Anaxagoras’s full knowledge of what it means; for it is not because everything is in everything that the dissociation does not occur.

Εἰπόντος τοῦ Ἀναξαγόρου οὐδὲ διακρίνεται οὐδὲ ἀποκρίνεται ἕτερον ἀπὸ τοῦ ἑτέρου διὰ τὸ πάντα ἐν πᾶσιν εἶναι, καὶ ἀλλαχοῦ οὐ κεχώρισται ἀλλήλων τὰ ἐν τῷ ἐνὶ κόσμῳ οὐδὲ ἀποκέκοπται πελέκει οὔτε τὸ θερμὸν ἀπὸ τοῦ ψυχροῦ οὔτε τὸ ψυχρὸν ἀπὸ τοῦ θερμοῦ (οὐ γὰρ εἶναι τι εἰλικρινὲς καθ’ αὐτό), τοῦτο, φησίν, οὐκ εἰδώς μὲν λέγεται· οὐ γὰρ διὰ τὸ πάντα ἐν πᾶσιν εἶναι συμβαίνει τὸ μὴ διακρίνεσθαι...

large.<sup>9</sup> In B3 Anaxagoras says of the small that there is “always a smaller” (on account of **NoLeast-P**) and “of the large there is always a larger” (on account of **NoLargest-P**); and he justifies his claim with the Parmenidean tenet that “what-is cannot not be,”<sup>10</sup> thus:

Not of the small is there a smallest, but always a smaller (for what-is cannot not be)—but also of the large there is always a larger.

οὔτε γὰρ τοῦ μικροῦ, φησὶν, ἐστὶ τό γε ἐλάχιστον, ἀλλ’ ἔλασσον  
ἀεί (τὸ γὰρ ἐὸν οὐκ ἔστι τὸ μὴ οὐκ εἶναι),—ἀλλὰ καὶ τοῦ μεγάλου  
ἀεί ἐστι μείζον.

What role does Parmenides’s dictum play in Anaxagoras’s argument? What I take Anaxagoras to seek to establish in B3 is that the scale representing the intensity of a certain property is limitless, in both directions, with no fixed minimum or maximum. The reasoning can be reconstructed as a *reductio ad absurdum*. If there were a minimum in the scale of intensity of an opposite, beyond which the opposite is no more, then further division (which is always possible on account of **NoLeast-P**, and amounts to decrease in intensity) would “destroy” the opposite. But this is impossible because it would violate Parmenides’s stance that what is cannot not be. Thus there cannot be a minimum end point on the scale of intensity of an opposite. *Mutatis mutandis* the same reasoning holds for the other end of the scale, the maximum (on account of **NoLargest-P**). Thus there are no extremes to the degree of intensity of an opposite. In other words, B3 establishes that the possibility of further reduction or increase in the intensity of an opposite can never be “exhausted.”<sup>11</sup> Let us now return to the example of the hot and the cold in B8, and examine

9. Treating the opposite small as metaphysically analogous to, e.g., the property hot or cold may be surprising to us but was not to the ancients; Plato posited Forms of the Large, the Small, the Hot etc.

10. See also the helpful discussion of the textual issue concerning the clause “for what-is cannot not be” in Curd (2010: 39–40).

11. See also section 2.3. in chapter 2.

how the conclusion reached in B3 can be used to justify the claim that the hot and the cold are inseparable. If there is always a smaller (i.e., less intense) and always a larger (i.e., more intense) point in the scale of an opposite, it follows that any given instance of, e.g., the hot will also be an instance of the cold, and thus inseparable from the cold. For, anything hot is also cold *relative to* something hotter (and anything cold is also hot relative to something colder). And, as it was established in B3, no matter where one starts in the scale of intensity of the hot, there will always be a hotter instance of the hot (and vice versa with the cold). In sum, the thought is that the hot is inseparable from the cold, the large from the small, and generally every opposite is inseparable from its own opposite, because every instance of one *of a pair* of opposites is also an instance of the other opposite.<sup>12</sup> The unlimited smallness and the unlimited largeness of the instances of pairs of opposites do not allow for any end-of-the-spectrum extremes of intensity in the range of any pair of opposites. Thus, every instance of an opposite is inseparable from an instance of its opposite on account of the relativity of their intensities. Let us now look at how Anaxagoras's reasoning unfolds in B8. There, he treats the hot and the cold as an instance of the general thesis that *all* opposites are inseparable: "For there is not anything pure by itself" (οὐ γὰρ εἶναι τι εἰλικρινὲς καθ' αὐτό). The case of the hot and the cold is to his mind a specific example of a general condition that holds true of all opposites. The problem with this line of thinking is that opposites *within a pair* are inseparable on account of their relativity. However, relativity does not generalize to *all* opposites (e.g., the hot and the wet), and so can't be the reason why they are inseparable. This concludes my reconstruction of the Argument from the Relativity of Opposites. The argument as such is not explicit anywhere in Anaxagoras's surviving texts. On the other hand it is plausible to think that he might

12. But note that the necessary inseparability of all opposites is a stronger and more general claim than this; this is about every instance of an opposite being inseparable from its own opposite, the other is about every instance of an opposite being inseparable from every instance of every opposite.

have tried to use **NoLeast-P** along those lines. One strong reason for thinking in this direction is Simplicius, who is our source for B8. He notes that there is a difficulty in the argument, reporting Aristotle's objection to it:

This, Aristotle says, is stated without Anaxagoras' full knowledge of what it means; for it is not because everything is in everything that the dissociation does not occur.

*τοῦτο, φησίν, οὐκ εἰδότης μὲν λέγεται· οὐ γὰρ διὰ τὸ πάντα ἐν πᾶσιν εἶναι συμβαίνει τὸ μὴ διακρίνεσθαι.*

Aristotle's (and Simplicius's) reasoning must be as follows. Contrary to what (they believe) Anaxagoras thinks, the inseparability of the hot and the cold does not presuppose the extreme mixture of all opposites. Rather, their inseparability is derivable from two premises only: that opposites have an infinite scale of degrees of intensity; and that because of that, the hot and the cold are always relative: there will never be an instance of hot that is not cold also. In conclusion, Aristotle's point must be that it is a mistake on the part of Anaxagoras to use the same justification for why the opposites within a pair and all opposites are inseparable, as I pointed out above.

### 3.1.2. The Argument from the Unlimited Smallness of the Quality Tropes

I turn now to a second way in which we can reconstruct on Anaxagoras's behalf an argument for the inseparability of all opposites, deriving it from **NoLeast-P**. We saw in chapter 1 that on Anaxagoras's conception, the universe has existed *ab aeterno* as a mixture of all the opposites. Things in the universe, e.g., a lump of earth, are clusters of tropes in the midst of a "haze" as it were of other tropes. How many tropes are there in the universe? And how many in the lump of earth? The answer is that the tropes are continuum dense: there are continuum dense tropes making up the lump

of earth, continuum dense tropes mixed with those, even if they are not constitutive of the lump of earth, and continuum dense tropes all around the tropes “in” the lump of earth. The reason why the shares of the opposites populate everything so densely is **NoLeast-P**. What the principle commits Anaxagoras to is a world where the fundamental elements, the tropes, are unlimited in number and unlimited in smallness, just as by analogy the constituent parts of an unlimitedly divisible line are unlimited in number and unlimited in smallness. As I understand Anaxagoras, he is saying that no instance of an opposite can be separate by itself, for the same reasons for which no point of a line can be separate by itself. The reason why a point cannot be separate by itself is that between the point and what it would be separate from, there is always a point.<sup>13</sup> This is what it is to be continuum dense—namely, that there is no next point from which a point can be separate. The same goes analogously in the case of tropes: that they are continuum dense means that there is always a trope between two tropes.

One further argument can be made, more Anaxagorean in spirit, by way of explication and justification of Anaxagoras’s position in B6, that “since it is not possible that there is a least, it would not be possible that [anything] be separated nor come to be by itself.” Every instance of an opposite is many instances of that opposite, because it always has proper parts that are instances of that opposite. Since the division is unlimited, every dividee is divisible and divided. Hence, there can be no atomic tropes: any instantiated trope is coinstantiated with further tropes of the same kind—its parts.

Recall, in connection with both arguments in this subsection, that the fundamental elements are such that their instances have no smallest part, as we saw in chapter 2. Anaxagoras’s example is the opposite small: “Nor of the small is there a smallest, but always a smaller”

13. Is it plausible to attribute this line of thinking to Anaxagoras? I submit it is; on account of the developments of mathematics at that time, as we know also from the work of Zeno of Elea, a contemporary of Anaxagoras. See also the appendix to chapter 4 on Zeno’s argument from multitude.

(B3); but the view generalizes to all opposites, as we know from B1.<sup>14</sup> Each opposite is equal to every other opposite in total amount (being unlimitedly large (B1)) and in the smallness of its shares or instances, which are unlimitedly small (B1) and the same in number with the shares of every other opposite (B6). Anaxagoras, who likes to make paradoxical or at least surprising statements, emphasizes that “the small, too, was unlimited” (B1) and equal to the large (B3).<sup>15</sup> Thus, I submit that it is the numerosity of the opposites that makes it to be the case that they are inseparable, as Anaxagoras suggests (without explicitly articulating an argument), for instance in B6, where we read, in relation to the example of the opposites large and small:

Since the shares of the large and the small are equal in number, in this way too, all things will be in everything; nor is it possible that [anything] be separate, but all things have a share of everything.

καὶ ὅτε δὲ ἴσαι μοῖραί εἰσι τοῦ τε μεγάλου καὶ τοῦ μικροῦ πλῆθος,  
καὶ οὕτως ἂν εἴη ἐν παντὶ πάντα· οὐδὲ χωρὶς ἔστιν εἶναι, ἀλλὰ  
πάντα παντὸς μοῖραν μετέχει.

From what we know from the extant texts, there is *no principle* by which to allot shares of opposites to any one thing that one might want to separate away from the rest (for instance, a lump of earth from the rest of the mixture). Thus complete separation of the tropes is not possible. All opposites are unlimited in smallness, unlimited in numerical and in total amounts, inseparable from one another, and compresent with one another—and it is in this sense they are all together in everything.

In conclusion, in this section we saw that **NoLeast-P** underpins the extreme mixture of all opposites. In the extant texts Anaxagoras does

14. B1: “*All things* were together, unlimited both in multitude and in smallness” (my emphasis) (ὁμοῦ χρήματα πάντα ἦν, ἅπειρα καὶ πλῆθος καὶ μικρότητα· καὶ γὰρ τὸ μικρὸν ἅπειρον ἦν). Note that I here depart from Curd in translating *plēthos* as “multitude” instead of “amount.”

15. B3: “And [the large] is equal to the small in multitude” (καὶ ἴσον ἐστὶ τῷ μικρῷ πλῆθος).

not articulate how, but we have enough information to reconstruct at least two ways in which he thought of deriving **EE-P** from **NoLeast-P**. What we need to turn to now is how to model—metaphysically—the extreme mixture of all opposites, on the basis of the central role **NoLeast-P** has in Anaxagoras’s ontology.

### 3.2. POWER GUNK

Abiding to the Parmenidean views discussed in chapter 1, Anaxagoras wants it to be the case that anything can “come out” of anything, to avoid admitting creation *ex nihilo* (and destruction) in his system. So he holds that there is a share of everything in everything, which is what allows anything to “come out” of anything, where it was already, as discussed in chapter 2. The challenge then is: what ontology could allow a share of everything to be in everything? A general concern for Anaxagoras is that *any* form of ontology positing indivisibles at the fundamental level would set a limit below which generation and change could not happen. It follows then that Anaxagoras holds that reality is atomless, and therefore *gunky*, to use our terminology. We may take for present purposes Ted Sider’s description of gunk as a standard modern account:

Borrowing a term from David Lewis (see for example Lewis (1991, 20)), let us say that an object is made of “atomless gunk” if it has no (mereological) atoms as parts. If something is made of atomless gunk then it divides forever into smaller and smaller parts—it is infinitely divisible. However, a line segment is infinitely divisible, and yet has atomic parts: the points. A hunk of gunk does not even have atomic parts “at infinity”; all parts of such an object have proper parts. (1993: 286)<sup>16</sup>

16. In the case of a line segment, the *points* into which it is *infinitely* divisible are extensionless; points have no extension in any dimension. It is usually taken to follow, and is here assumed, that points are simple, and do not have parts. Under

In positing that reality is atomless, Anaxagoras is the first gunk lover in the history of metaphysics.<sup>17</sup> But his innovations in metaphysics go even beyond that. That the universe might be made out of *material* gunk is a possibility that philosophers are currently investigating, and theoretical progress is being made. But now consider the possibility that the ultimate elements of our world are not matter, but instantiated physical properties, or qualities; and further, that these instantiated qualities are not atomic, but gunky—what then? How are we to conceptualize a universe of *qualitative* gunk? Gunky properties have not even been conceptualized so far. Yet, on my interpretation of Anaxagoras's system, his world is a world of physical *qualitative* gunk. This is, to my knowledge, the first and only instance of this type of gunk in the history of philosophy.

The conclusion that Anaxagoras introduces qualitative gunk, rests on the fact that what is gunky in his ontology are the opposites. As we saw in chapter 1, the opposites are instantiated properties, tropes, which do not qualify any underlying material substratum, but whose clustering makes up matter by phenomenal emergence. There is an additional aspect to Anaxagoras's ontology that makes it so distinctive: his opposites are causal powers. Without rehearsing here the arguments made in chapter 1, if the opposites are indeed causal powers for Anaxagoras, as I contend, what he introduces in metaphysics is *power gunk*, where what is gunky are instantiated causal powers. If on the other hand, one wants to remain uncommitted regarding the nature of the opposites, one can think of them generically as properties or qualities, and his ontology as qualitative gunk. In what follows

this conception, points are the *atoms* of the line segment, and the line segment is not gunky. One might on the other hand think of a line segment as not being divisible into extensionless points, but only into smaller and smaller *segments* ad infinitum. In that case, the line segment is gunky. Similarly, if a surface has line or point atoms, it is divisible into lines or points, which are its atoms. If a surface is gunky, if it is divisible into smaller and smaller surfaces, all of which have surfaces as proper parts.

17. Even when the thought that Anaxagoras might have been an *ante litteram* gunk lover was aired in the past, by Theodore Sider (1993) and Hud Hudson (2007), crucially this was with no supporting argument or textual analysis.



I will cast in the discussion of Anaxagoras's gunk in terms of qualities rather than powers, for the sake of highlighting its metaphysical significance no matter what particular interpretation of the ontological status of the Anaxagorean opposites one favors. We can thus define qualitative gunk in terms of a property's instances being gunky:

**QG:** An instantiated physical property (i.e., a trope) is gunky if and only if every part of it has a proper part that is an instantiated physical property (a trope).<sup>18</sup>

A further unique feature of Anaxagoras's ontology is that the instantiated opposites are not potentially *divisible* into proper parts that have proper parts, etc., ad infinitum. Rather, they are actually *divided* into their gunky parts, *as if* the supertask of "chopping" them up thoroughly had been completed.<sup>19</sup> We can infer that the opposites exist as thoroughly divided from B1, where Anaxagoras says that "all things were together, unlimited both in multitude and in smallness" (ὁμοῦ χρήματα πάντα ἦν, ἄπειρα καὶ πλῆθος καὶ σμικρότητα). We will return to the issue of the actual division of the opposites in the following section, 3.3, but before concluding this section there is a further point to consider. While the fact that opposites for Anaxagoras are actually gunky does facilitate the extreme mixture and inseparability of the shares that Anaxagoras wants, because of the numerosity of the shares that exist in nature, it also raises a new philosophical challenge. Are the shares causally powerful no matter how small they are, or only up to a certain level of division? Anaxagoras has an answer to this question: there is evidence that he thought that the

18. In the case of Anaxagoras's properties, i.e., the opposites, every proper part of an instantiated property is an instance of *that* property. This is so because his properties are homoeomers, where every part is of the same kind as the whole. But nonhomoeomeric properties can also be gunky.

19. Anaxagoras assumes directly thoroughly divided elements in the universe, without positing that any supertask has been performed. On the other hand, modern metaphysicians when discussing actual gunk describe it as the result of the supertask of chopping something up, to facilitate our "visualization" of it.

opposites are such that their parts are uniform (or homoeomers, to use Aristotle's term), i.e. the same in kind as the whole of which they are parts. For instance, the parts of an instance of, e.g., the hot are also instances of the hot; and the parts of an instance of the small are also small (as Anaxagoras reiterates when he formulates **NoLeast-P**). This means that the division leaves their nature "intact"—which is needed to preserve their powerfulness at any level of division.

A final remark before concluding this section. The overall interpretation of Anaxagoras's extreme mixture in terms of gunk that I develop in this chapter does not depend on giving the opposites the particular status in Anaxagoras's ontology of ultimate building blocks to which stuffs is reducible. As we saw in chapter 1, there is a line of interpretation of Anaxagoras's ontology that considers stuffs irreducible and real, rather than derivative and reducible. On this alternative view stuffs such as blood or gold are not composed out of the opposites, but are primitive. I will briefly sketch now how my interpretation can be equally developed on the alternative view, taking Graham (2004) as its representative. Let us assume per hypothesis that Anaxagoras's ontology is built on fundamental opposites *and* fundamental stuff, instead of opposites only.<sup>20</sup> The qualitative gunk interpretation I am developing in this chapter would then apply to this ontology as follows. The various kinds of opposites and kinds of stuff exist in the primordial mixture as gunky, divided into parts of unlimited smallness. The vortex started by *nous* moves them around in the mixture generating preponderances such as of milk, of gold, of flesh, etc. These preponderances are phenomenally perceptible as such, i.e., as milk or gold or flesh, etc. Preponderances of the opposites in the same regions of space result in such stuff being hot, or cold, or dry, etc. *Ceteris paribus*, an ontology of only opposites as fundamental is more economical, as Graham too, for instance, recognizes (2004: 7); and as I argued, I find it a preferable interpretation. In the following sections I will argue that it is the gunky nature of the

20. In addition, on both interpretations, there are also seeds and *nous*.

opposites, on account of the actual infinity of the number of their shares, that allows them to be everywhere and thus in everything—all together and inseparable.

### 3.3. DIVIDED GUNK

In order to assess the philosophical soundness of the view I attribute to the Anaxagoras,<sup>21</sup> we need to consider whether there are special difficulties about conceptualizing actual gunk, which do not arise with potential gunk. To address this question, let us look at another modern description of gunk in addition to the one offered by Ted Sider (given in section 3.2), which interestingly is formulated in a way that can be read as referring to either potential or actual unlimited division. Achille Varzi (2016) talks of gunk as

the hypothesis that the universe might consist of “atomless gunk” (Lewis 1991: 20), i.e., that either space and time or matter, or both, [or instances of physical properties, to include Anaxagoras’s version] divide forever into smaller and smaller parts.

It is the expression “divide forever” that may refer to potential or actual unlimited division. My thought is that conceiving of unlimitedly divided matter and conceiving of continuous matter with unlimitedly many parts have the same conceptual complexity. So my conclusion is that there aren’t special conceptual difficulties with the structure of actual gunk, if one is willing to allow for potential gunk.

What are the actually gunky parts of something? Is there anything there at all, as it were, at that level of division? What is left cannot be extended parts, because they would be further divisible and therefore not actually gunky. It cannot be infinitely many point-like entities of zero extension, because they also would be indivisible and

21. And to the Stoics too, as we will see in chapter 6.

like atoms, which is incompatible with the hypothesis that the opposites are actually gunky.<sup>22</sup> Perhaps thorough division destroys what is divided? Alexander of Aphrodisias already entertained this thought and the difficulties associated with it:

If the constituents leave no undivided reminder in the blend they would be divided through and through, and not into parts but into divisions, if no particle of them remains beyond the division. (*On Mixture* 221.34–36)

εἰ δὲ μηδὲν ἀδιαίρετον ἀλλήλων ἐν τῇ κράσει καταλελοίπασιν,  
εἴη ἂν πάντῃ διηρημένα καὶ οὐκ εἰς μέρη, ἀλλ' εἰς διαιρέσεις  
ἢ τομῇ γεγονυῖα, εἴ γε μηδὲν αὐτῶν μόριον παρὰ τὴν διαίρεσιν  
καταλέλειπται.

Interestingly, we find this metaphysical concern restated in a different, modern context by John Hawthorne and Brian Weatherson, who explore the possibility of actual gunk:

One might . . . think that matter sometimes vanishes as a result of some sequence of cuts. . . . If we are allowed to suppose that gunk may vanish, then it will be perfectly consistent to say that nothing is left at the limit of super-cutting. (2004: 341)

Of relevance to our present investigation, Hawthorne and Weatherson proceed to consider what is the case in a world where actual gunk does not in fact “vanish” into nothingness—and so will we, with Anaxagoras. Anaxagoras, too, considers the possibility that divided gunk vanishes into nonbeing, and he explicitly rejects this option, claiming that thorough (unlimited) division of the elements does *not* destroy them: “Nor of the small is there a smallest, but always

22. T. Sider, for example, comments on the difference thus: “A line segment is infinitely divisible, and yet has atomic parts: the points. A hunk of gunk does not even have atomic parts ‘at infinity’” (1993: 286).

a smaller; for what is cannot not be" (B3), echoing Parmenides. I will therefore assume axiomatically for present purposes that when division is applied within the domain of extension, repeated division is not a mechanism that can rid parts of their extension.<sup>23</sup> Anaxagoras's hunks of gunk cannot have extension, nor can they be without extension, though on account of their thorough division, we can now conclude that they *approximate zero extension as a limit*. The division makes them be scattered into continuum-many parts, with aleph-1 cardinality.<sup>24</sup> This realization will enable us to understand how Anaxagoras's gunky opposites can be everywhere, compresent with each other.

### 3.4. GUNK'S LOCATION IN SPACE

Anaxagoras assumes in his ontology a thorough division of the instantiated opposites in the cosmic mixture. Each constituent is unlimited with respect to its total quantity in the universe and the number of gunky parts it is divided in, and each of the parts is unlimitedly small. From this follows that there are no continuous "stretches" of one mixant where all the other mixants are not present. Let me restate before moving forward that what we are looking for is a metaphysical model for colocation that can explain the following stance of Anaxagoras's. For him, gunky opposites are mixed by being colocated throughout the space in which their mixture extends, in the sense that each part

23. For anything small, there can be something smaller. So division does not lead to "extinction" of the divided item. Some commentators have read in this position of Anaxagoras a denial of Zeno's conclusions about complete divisibility ending into nothingness. There are also those who doubt or positively argue against this conclusion. Curd (2010: 39), for instance, raises doubts on whether the conclusion is warranted. On the one hand Anaxagoras only states **NoLeast-P**; he does not argue in any open critical engagement with Zeno. On the other hand Curd notes that Zeno is concerned only with extinction of being just by division, while Anaxagoras is stating that being is not extinguishable in any way. See also the appendix to chapter 4.

24. Aleph-1 is the cardinality of the actually divided gunk, as Hawthorne and Weatherson argue (2004: 340).

of the mixture, no matter how small, contains parts of all its constituents. How, then, can Anaxagoras's opposites be so colocated? Recall that in section 3.3 we established that the status of divided gunk that Anaxagoras's opposites exist in means that their shares *approximate nonextension*. This is what allows them to overlap with each other in the same location, and thus be colocated.<sup>25</sup> We saw in section 3.1 that Anaxagoras states in B6,

Since it is not possible that there is a least, it would not be possible that [anything] be separated, nor come to be by itself, but just as in the beginning, now too all things are together.

ὅτε τοῦλάχιστον μὴ ἔστιν εἶναι, οὐκ ἂν δύναιτο χωρισθῆναι, οὐδ' ἂν ἐφ' ἑαυτοῦ γενέσθαι, ἀλλ' ὅπως περ ἀρχὴν εἶναι καὶ νῦν πάντα ὁμοῦ.

There is no further argument in Anaxagoras's fragments for this claim of universal inseparability, namely that no opposite can be isolated so that it is not mixed with the other opposites. When we reconstructed on his behalf two lines of arguments in support of that conclusion (in section 3.1), we found the numerosity of shares and the lack of a principle to allot them to be a sound way to derive Anaxagoras's desired conclusion. We are now in the position to see which metaphysics underpins this reasoning. When the infinity of shares of each of the gunky opposites is mixed with the infinity of shares of the other opposites, there is no physical method by which they can be thoroughly separated, even if there can be partial extraction of some out of the rest of the mixture. Although this has the air of a mere empirical statement, it seems that for Anaxagoras it has the status of natural law, on account of the actually gunky nature of the opposites.<sup>26</sup>

25. The convergent colocation of the mixants does not entail that the mixants share parts.

26. In chapter 6 I will argue for the claim that actual gunk underpins, with significant differences, the Stoic stance that bodies exist as thoroughly mixed. That another group of ancient thinkers put actual gunk thus to use is in a way surprising, but it also

This very mathematical approach to reality Anaxagoras takes is in line with that of many of his contemporaries. Anaxagoras belongs to the very first generation of cosmologists and mathematicians who investigated the concept of the infinite at its “birth.”<sup>27</sup> As I will show in some more detail in the appendix to chapter 4, Zeno’s argument from multitude, along with his regress argument about the divisibility of motion, are significant for our Anaxagorean investigation because they involve the type of infinity that is required to conceptualize gunk. Zeno’s infinities gave definitional expression to *continuum infinity*, namely the infinity of the real numbers, which is what Anaxagoras’s definition of the constitution of the opposites requires: “Nor . . . is there a smallest, but always a smaller” (B3). This is also the time that the Pythagoreans (reportedly Hippassus of Metapontum, fifth century BC) discovered the irrational numbers, whose specification requires infinitely many integers. In this same age, Democritus calculated the volume of a cone and a pyramid using infinitely many planes. In short, this is a time in which it is plausible to assume that Anaxagoras could have operated with the concept of infinity in the way I argue he does.

### 3.5. THE GRIND MODEL

Before developing further the model I interpret Anaxagoras as holding, I will engage critically with another existing interpretation in the secondary literature that is close to, yet importantly distinct from

adds plausibility to the claims I make about Anaxagoras. Actual gunk was a view that the ancient could entertain.

27. Thus, for instance, Wilbur Knorr: “The interaction of philosophy and mathematics is seldom revealed so clearly as in the study of the infinite among the ancient Greeks. The dialectical puzzles of the fifth-century Eleatics, sharpened by Plato and Aristotle in the fourth century, are complemented by the invention of precise methods of limits, as applied by Eudoxus in the fourth century and Euclid and Archimedes in the third” (1982: 112).

mine. It was put forward by Richard Sorabji (1988). I call it the Grind model, borrowing the expression from Eric Lewis (2000: 6). Sorabji holds a distinctive reading of **EE-P** and its metaphysical consequences. As I do, Sorabji focuses on the compresence of Anaxagoras's fundamental entities. He writes that

Anaxagoras may have thought in terms of an infinitesimal powder. The mixture is like what one would have, if bone and honey had (counterfactually) started in isolation, and been ground to powder and stirred together, only the grinding would have gone on until the particles were "infinitely small." . . . The units will need to be sizeless to avoid nuggets of isolated bone or honey. For in a positively sized nugget of bone, there would be inner parts not surrounded by honey; whereas in an infinitesimal powder every bit of bone could be together with some honey. . . . The doctrine of something of everything in everything will mean that there are infinitesimal units of each kind either at every point, or at least in every positively sized region however small. (1988: 64)

Sorabji's explanation of **EE-P** in terms of the Grind model is close in some respects to the gunk model I have presented in this chapter. One important difference is that Sorabji thinks of Anaxagoras's fundamental elements in terms of ground stuffs, e.g., bone and honey, rather than opposites, as I do. But for present purposes I will here focus on the metaphysics of division that Sorabji envisages, how it compares to mine, and whether it delivers a sound account of **EE-P**. Sorabji wonders whether the infinitesimally small bits of stuff are sizeless or positively sized, and correctly concludes that if they are positively sized, then they would be further divisible, and the mixture would not be complete. If on the other hand they are sizeless, then "every bit of bone could be together with some honey," as stated in the quotation above. But on this line of thinking a problem arises for Sorabji's interpretation: if there were sizeless bits in the grind, this would contradict Anaxagoras's **NoLeast-P**, since the sizeless bits



would be indivisible atoms in the ontology, like points. Anaxagoras does not allow for a smallest in the ontology. Hence, Sorabji's model cannot ultimately account for colocation. For my part, I appeal to convergence to zero extension to account for the colocation of the hunks of gunk in Anaxagoras's cosmic mixture. Although having zero extension is not allowed in Anaxagoras's ontology, we can use it as a limit of magnitude, to describe his gunky ontology.

While the Grind model has not received due attention in the literature,<sup>28</sup> it has been discussed quite closely by Eric Lewis (2000), who examines it in connection to the metaphysics of Stoic fusion, concentrating on the issue of colocation. Lewis compares two coextension models, the Grind model and the Stoic Blend model, and finds them of equal explanatory value in relation to Anaxagoras's extreme mixture, to the point that Lewis declares he ultimately cannot declare that either is more apt than the other (2000: 13). Of the Grind model, going beyond what Sorabji has written, Lewis distinguishes two versions:

The grind model . . . comes in two types. [Lewis calls the two versions the particulate-juxtaposition model and the particulate-coextensive model]. Either the infinitesimally sized particles are juxtaposed, or they are completely coextensive. Given the first option [which is Sorabji's], we do not strictly have everything found *at every location* within a compound thing, only within a positively sized region. (2000: 12–13)

We need then to concentrate on the particulate-coextensive model, where the infinitesimally sized particles are coextensive:

What about the particulate-coextensive model? . . . If [it] . . . is to do the work it is intended to do, the relation between particles

28. Curd (2010: 183), for instance, groups Sorabji with those holding a particulate interpretation.

which occupy distinct locations must at least be a dense ordering (only then there will be everything in any positively sized region). This is close to saying that collectively these particles form a continuum, which seems to be a defining feature of the blending model. (2000: 12–13)

The Stoic Blend model that Lewis examines is that of liquids that are assumed to be (nonatomic and) homogenous. They are blended together so that “all of the blended ingredients are present at every location in the blend” (2000: 3). Have we here found one and possibly even two solutions for Anaxagoras’s extreme mixture puzzle? I submit the answer is no: neither Sorabji’s Grind model or the Stoic Blend model as understood by Lewis delivers colocation. The reason can be more clearly brought out starting from the Blend model. On this model, two constituents can occupy the same volume by “being spread throughout the mixture at a lower density,” as Sorabji notes (1988: 63). I cannot see, however, how a blend of nonatomic homogenous liquids could spread through a mixture at lower densities.<sup>29</sup> The volume of the blend of two liquids is equal to the sum of the volumes each liquid occupies on its own. It does not seem right to call on a model to help us understand a physical scenario, while requiring the model to behave in ways that do not comply with its physics. If on the other hand the volume of the blended liquids is the sum of the volume of the liquids that were mixed, then it cannot be that the liquids are colocated—rather, they are juxtaposed. The same problem arises for the Grind model, if the infinitesimal particles are not sizeless, like points, but have size. They will not be colocated, but juxtaposed. (I will offer more sustained arguments in chapter 4 against the plausibility of explaining Anaxagoras’s theory of extreme mixture in terms of juxtaposition.)

29. Unless one adopts Daniel Nolan’s conception of weak location discussed in section 6.2 of chapter 6.

### 3.6. CAN THERE BE PREPONDERANCE IN A GUNKY WORLD?

In the preceding sections of this chapter we examined the metaphysical significance of **NoLeast-P**, which is the keystone of Anaxagoras's ontology. **NoLeast-P** underpins his conception of the opposites as actually gunky. The question we want to investigate in this section is whether his ontology of gunky opposites as derived from **NoLeast-P** can indeed explain, as Anaxagoras thought it could, composition, difference, and change in things via **P-P**. Can there be preponderance in a system where there are gunky shares of everything everywhere? The view I want to defend is that Anaxagoras had mixed intuitions about *both* a *countable* and an *uncountable infinity*, and that this led him to combine in his ontology **NoLeast-P** (interpreted as involving unlimited division) with **P-P**, although they are in fact *incompatible*. Before examining the difficulties that combining the two principles generates, let us briefly recall why **P-P** was posited and what metaphysical work it does in Anaxagoras's ontology. We saw in chapter 2 that according to **P-P**, if an opposite is preponderant in relation to the other opposites in a region of space, it is perceptually evident there,<sup>30</sup> and, e.g., the thing in question (which is a bundle of opposites) appears hot, rough, hard, etc. to us. This is stated, for instance, in B12.<sup>31</sup> Thus, when an opposite is preponderant in a thing, it characterizes the thing, determining its profile of perceptible properties. A combination of preponderant opposites in a region, such as the dense, the wet, the cold, and the dark, can compose (*modulo* perception) into a type of thing such as earth, as we read in B15.<sup>32</sup> If on the other hand there are no preponderant opposites, as for example in

30. Given a certain level of preponderance, *modulo* human perceptual abilities.

31. B12: "Nothing else is like anything else, but each one is and was most manifestly those things of which there are the most in it" (ἕτερον δὲ οὐδὲν ἐστὶν ὁμοιον οὐδενί, ἀλλ' ὅτ' πλείστα ἐνι, ταῦτα ἐνδηλότατα ἐν ἑκαστόν ἐστι καὶ ἦν).

32. B15: "The dense and the wet and the cold and the dark came together here, where <the> earth is now" (τὸ μὲν πυκνόν, φησί, καὶ διερόν καὶ ψυχρόν καὶ τὸ ζοφερόν ἐνθάδε συνεχώρησεν, ἐνθα νῦν <ἡ> γῆ).

Anaxagoras's primordial mixture from which the world derives, the whole is perceptually indistinct, as stated in B4b.<sup>33</sup> Since the opposites are all compresent everywhere in the universal mixture, preponderance brought about by the increased presence of an opposite in a region of the mixture results in an increase of *density* of that opposite in that region.<sup>34</sup> Our question here is: can hunks of gunk be denser in some region of space, when they are colocated everywhere in space?

Anaxagoras was familiar with examples of aleph-0 infinity; he was, for instance, familiar with the infinity of the series of integers. But he was also familiar with examples of aleph-1 infinity; e.g., from the infinite divisibility of the continuum in Zeno's paradoxes.<sup>35</sup> Aleph-0 infinities do allow for preponderance. As Euclid showed, there are infinitely many prime numbers—yet the Prime Number Theorem tells us that there are more prime numbers among the first 100 integers than among any other 100 integers.<sup>36</sup> So the infinity of the primes displays regions of *higher density* or preponderance, at the beginning of the infinite series. It would therefore not be unnatural for Anaxagoras to have intuitions about the possibility of preponderance in relation to infinity. But if the colocation of everything is to

33. B4b: "Before there was separation off, because all things were together, there was not even any colour evident; for the mixture of all things prevented it, of the wet and the dry and of the hot and the cold and of the bright and the dark" (πρὶν δὲ ἀποκριθῆναι [ταῦτα] πάντων ὁμοῦ ἐόντων οὐδὲ χροὶ ἔνδηλος ἦν οὐδεμία· ἀπεκάλυε γὰρ ἡ σύμμιξις ἀπάντων χρημάτων, τοῦ τε διεροῦ καὶ τοῦ ξηροῦ καὶ τοῦ θερμοῦ καὶ τοῦ ψυχροῦ καὶ τοῦ λαμπροῦ καὶ τοῦ ζοφεροῦ, καὶ γῆς πολλῆς ἐνεούσης καὶ σπερμάτων ἀπειρῶν πλῆθος οὐδὲν ἐοικότων ἀλλήλοις).

34. This, for Anaxagoras, increases the perceptibility of the opposite in that region. As we saw in chapter 2, it is not clear exactly how increased density makes an opposite more perceptible—by the increased *amount* of the opposite, or by the increased degree of *intensity* of the opposite (or both, which is the view I favor). Both readings could be supported textually. But what makes crucial difference for our discussion here, as we will presently see, is that both the amount and the intensity readings require higher *density* of the opposite in the region.

35. There is some discussion in the literature concerning how early the distinction between aleph-0 and aleph-1 infinities was made, and in particular concerning the evidence as to whether Democritus (who was younger than Anaxagoras) distinguished between the two types of infinity. See Vita (1984).

36. See Oswald Riemenschneider (2007).

be explained through the unlimited smallness of the shares of the opposites, which are continuum-dense (i.e., of aleph-1 cardinality), is such an infinity of shares compatible with their variable density? Is it possible for an opposite to be preponderant in relation to the other opposites in any region of space, in view of the fact that all the opposites are distributed gunk in every region of space? The answer is that it is *not* possible, any more than it would be possible to make the points of a line denser in some section of the line.<sup>37</sup>

In concluding this chapter, I turn now to explore in a speculative fashion a possible way of combining **NoLeast-P** and **P-P** (under a specific reading) that can deliver the metaphysical results Anaxagoras wants to derive from them. It is *not* a textual reading that I am offering—rather, it is a possible way of thinking along Anaxagoras’s lines that meets all his metaphysical desiderata with no inconsistency. I call this the Wave Field model. This model presupposes that we take “least” in **NoLeast-P** *not* to be the opposite of “more” in **P-P**. Suppose per hypothesis that each opposite is and behaves like a gunky *wave field*. Different opposites are like waves of different wavelengths and hence frequencies.<sup>38</sup> Each wave field spans the whole universe in every direction. Let us stipulate as a law of nature in this universe that the waves can interact only with waves of the same wavelength.<sup>39</sup> On this model, adding (superposing)

37. As a one-meter line and a two-meter line have the same number of parts, aleph-1, similarly opposites of different extent divide into the same number of parts. Chrysippus, for instance, already noted in antiquity that a quantity of substance could be spread through a much greater area by blending with another than it could be spread on its own. For example, a drop of wine could blend with the entire sea (Long and Sedley 1987: 48B). Daniel Nolan says in relation to Stoic blending of unequal quantities of mixants:

One interesting thing about this gunky construal of blending is that no conclusions about the volume of the blend follow simply from the assumption that a blend is created such that, for one infinite division . . . every one of those parts of the blend contain parts of the blended substances. (2006: 176)

I present my account for this Stoic view in section 6.1 of chapter 6.

38. Waves like Anaxagoras’s opposites can be gunky. A gunky wave can be thought of as the distribution of values through gunky space.

39. This can be a possible world that has different physical laws from our actual world.

waves of the same wavelength to one another increases their amplitude, but does not change their wavelength or frequency (per stipulation, waves of different wavelengths do not interact with one another). Let us say that the increase in the amplitude of a wave corresponds to an increase in the intensity of an opposite (by preponderance). Then this is a world in which the opposites all overlap with one another throughout the whole universe—an opposite can be added to or subtracted from an opposite of the same kind, making their intensities stronger or weaker, though the kind of each opposite cannot change. This model *avoids density* and interprets preponderance as higher amplitude, resulting from the addition of waves of the same wavelength. To get the model aligned with Anaxagoras's actual ontology (as we know it from the extant texts), one would have to think of a way in which waves are not only in motion, but can be moved, as the opposites are moved by the vortex in Anaxagoras's system. Both the addition/subtraction and the movement of waves would require that there are different sources of waves of the same type, so that, e.g., the waves of hot could be added to / subtracted from each other, or be moved in different directions at the same time independently of one another. Which sort of stuff could be composed from waves of different types, and which sort of objects could be built from the stuff, would depend on how each kind of wave is divided into different sources of that wave.<sup>40</sup> The Wave Field model, which I have here only sketch—leaving some of the details to the reader to work out—provides a physical structure that can make sense of qualitative gunk being compresent everywhere and exhibiting preponderance in places, and hence can do justice to Anaxagoras's intuitions about gunk. On the other hand, as I mentioned at the outset, developing this model requires us to make stipulations that Anaxagoras did not make and possibly could not make because, among other reasons, his understanding of infinity was not as advanced as ours.

40. In such a world there would be gunky sources of waves (of different kinds).

To conclude then, it was not clear to Anaxagoras that some infinities allow for higher density, and thus preponderance of some opposites, while other infinities do not allow for higher density. Although Anaxagoras had scientific “exposure,” via the mathematics under development at his time, to both aleph-0 and aleph-1 infinities, I submit that he could not distinguish clearly between their mathematical properties and hence their densities. As I understand Anaxagoras’s thought, he had intuitions about two aspects of infinity: that their *unlimited smallness* makes thorough mixing of the opposites possible, through their colocation, and that their *variable density* explains difference and change of intensity of opposites. The result of the combination of these intuitions into a single system was a metaphysically novel and unique ontology of qualitative gunk. We, with Cantorian hindsight, can give up the requirement that gunk be of variable density and explore the explanatory possibilities of this type of gunk, which may offer novel solutions to the problems of colocation, contact, containment, composition, constitution, mixing, and property-instantiation.

### 3.7. CLOSING REMARKS

In chapter 1 we saw Anaxagoras’s aim is to explain the phenomenon of generation in nature, by way of a mixture of primitive and eternally existing constituents. Such constituents are for him instantiated properties—causal powers, I submit. With them, and the principles introduced in chapter 2, Anaxagoras developed an ontology of extreme mixture, whereby there is something of everything in everything. In this chapter we saw that the way everything is in everything is by compresence. We further investigated the unique mereology that Anaxagoras introduced to underpin his theory of extreme mixture. Anaxagoras was the first gunk lover in the history of metaphysics. What he contributed to metaphysics is not only gunk, but *qualitative* or *power gunk*. His opposites are scattered hunks of actual gunk, which can be colocated with each other on account

of the fact that each approximates nonextension. Thus each opposite extends over the whole of the spatial region occupied by the mixture, and its gunky constitution allows it to be colocated with the other constituents at every region of the mixture. It is in this sense that in the Anaxagorean mixture *everything is in everything*, namely, each opposite is scattered *everywhere* in the mixture. (In chapter 4 we will see in which ways my proposed interpretation differs from the existing ones, and which difficulties the alternatives remain prey to.)

In the present chapter we also discussed an existing tension in Anaxagoras's use of infinities to develop his ontology. To my understanding, Anaxagoras has intuitions about two aspects of infinity: that their *unlimited smallness* makes thorough mixing of the opposites possible, through their colocation, and that their *variable density* explains difference and change of intensity of opposites. We saw in chapter 2 how he uses variable density to explain (via quantitative preponderance) the composition of things, e.g., into earth or flesh; that things have different properties, e.g., that they are cold or dry; and that things change, e.g., from being cold to being hot. On the other hand we saw in this chapter that he uses the unlimited smallness of the opposites to account for how they can be everywhere in the mixture of everything with everything. That Anaxagoras had divergent, and perhaps not clear, intuitions about infinity is not surprising, given that the concept was just then being developed in Greek mathematics. Yet with his intuitions Anaxagoras developed a metaphysical system that represents a great legacy.

To conclude this chapter, a few brief considerations are apropos on the significance of Anaxagoras's gunk ontology, against the backdrop of the metaphysical theories that immediately followed his own, and also that of contemporary metaphysics. On my proposed interpretation, Anaxagoras is the first gunk lover in the history of metaphysics. Interestingly, for him gunk is not simply a theoretical possibility that cannot be ruled out in principle (as it is for modern gunk lovers). Rather, it is a view that follows cogently from his metaphysical analysis of the physical world of our experience, via the various principles examined in chapter 2. What participation in



Forms does for Plato's ontology and what instantiation of universal forms does for Aristotle's, gunk does for Anaxagoras: it makes properties readily and directly available anywhere in the universe, to account for the identity and similarity of things in the world. Gunk is a parsimonious metaphysical solution as, with it, a number of issues that are still unresolved in metaphysics can simply be avoided: for instance, problems concerning the multiple recurrence of one and the same entity, the Aristotelian universal; or concerning the iterative participation in one and the same entity, the Platonic universal. Furthermore, gunk does not require positing a characterless substratum in one's ontology. Rather, with Anaxagoras's gunk we see one of the earliest conceptions of properties as tropes and of substances as bundles of tropes. What is distinctive about Anaxagoras's take on gunk is not only what motives the view, but also the particular type of gunk that he develops. It is *qualitative* gunk, rather than *material* gunk. As we saw in chapter 1, Anaxagoras's ontology was developed before matter was "invented." It includes tropes only—they are gunky. The resulting metaphysical view, a world of qualitative gunk, is new, in the sense of being hitherto unexplored. And if Anaxagoras's opposites are causal powers, which is the interpretation I favor (as argued in chapter 1), the view acquires even further complexity and turns out to be even more innovative, as Anaxagoras is pioneering *power mereology* and positing a world of *power gunk*.

In modern philosophy, the metaphysics of powers and of laws of nature have been a very lively area of research in recent years. A variety of directions of inquiry are being explored, including, for example, whether powers at the fundamental level are "pure" or they are in need of a categorical (inert) bases; what the relation is between a power and its manifestation; what the nature of a power's manifestation is; whether the identity of a power is structurally determined by all the relations it holds to other powers; whether powers embody a special modality, different from necessity and contingency; etc. In sum, there is a vibrant area of research in contemporary metaphysics where many philosophers are working to develop power ontologies to explain the metaphysics of the fundamental level of reality as science reveals it to

us. But the *atomicity of powers* (that is, their internal simplicity and indivisibility) is a crucial assumption that research in power metaphysics has not examined so far—and yet Anaxagoras did! Anaxagoras did not have all the answers to the questions that his own ontology raises. In fact, we have even fewer of his answers, due to the fact that only fragments of his work remain. But the originality of his thought, and the uniqueness of his ontology in the history of philosophy, make the questions it raises worth exploring and pursuing today. Drawing on Anaxagoras’s insights, this chapter has offered a sketch of what a qualitative gunk ontology looks like by exploring what motives it and highlighting the differences of qualitative gunk from material gunk. The following chapter is a critical review of the existing alternative interpretations of Anaxagoras’s theory of extreme mixture which will bring out from a different angle the merits of the one offered in this chapter.

### 3.A. APPENDIX: AN OVERVIEW OF ANAXAGORAS’S MAIN METAPHYSICAL PRINCIPLES

- *Principle of Universal Extraction*  
**UE-P:** Any opposite or combination of opposites can be extracted from any other combination of opposites.
- *Everything-in-Everything Principle*  
**EE-P:** There is a share of everything in everything.
- *No Least Principle*  
**NoLeast-P:** There is no lowest limit to the magnitude of the opposites.
- *No Largest Principle*  
**NoLargest-P:** There is no upper limit to the magnitude of the opposites.
- *Preponderance Principle*  
**P-P:** A thing is *f* if and only if the opposite *f* is preponderant in that thing’s constitution (in relation to other opposites also present in the thing).

- *Necessary Inseparability Principle*  
**NoSep-P:** No instance of an opposite can occur distinctly, by itself (but always together with instance[s] of opposite[s]).
- *Qualitative gunk*  
**QG:** An instantiated physical property (i.e., a trope) is gunky if and only if every part of it has a proper part that is an instantiated physical property (a trope).

## Compresence versus Containment of the Opposites

Anaxagoras's claim that there is a share of everything in everything is at the very core of his metaphysics. Taken at face value, the claim sounds barely intelligible. Its brevity leaves much work to be done by the interpreters. Each of the very few words that appear in it, as well as the general metaphysical picture that the principle expresses, have been subject to much investigation in the scholarly literature, even since antiquity. Yet no consensus has been reached. The challenge is to understand not only what metaphysical position the principle expresses, but also how it fits with the other principles governing Anaxagoras's ontology. I argued for a fresh line of interpretation in the preceding chapter, which I now want to compare and contrast with the existing alternatives, to bring out further what is distinctive about it. Interestingly, ancient and modern scholars have converged on three main lines of interpretations of Anaxagoras's principle that there is a share of everything in everything. They are the so-called Particulate, the Proportionate, and the Liquids interpretations.<sup>1</sup> On the Particulate interpretation, the fundamental elements of Anaxagoras's ontology are conceived of as actually present *as such* in

1. Supporters of the particulate interpretation include among others Raven (1954), Guthrie (1965), and Kerferd (1969). Supporters of the proportionate interpretation on the other hand include Strang (1963), Barnes (1979), Schofield (1980), and Mourelatos (1986). Sorabji's (1988) interpretation and Lewis's (2000) discussion of it are examined separately in chapter 4.

the extreme mixture out of which of everything is composite, as material (indivisible) *particles* of finite size which are too small to be perceptually discerned as such. The mixture appears to be uniform, but it isn't. On this interpretation, the qualitative variety of the existing stuffs is accounted for in terms of concentration of particles of different kinds at different locations. On the Proportionate interpretation on the other hand, the total quantity of each type of fundamental element is mixed together with the total quantities of the rest of them, *in some proportion*. The totality is a mixture that is uniform through and through, and the mixture is infinitely divisible. As has already been extensively discussed in the literature, both lines of interpretation are prey to difficulties. They both lack positively supportive textual evidence and in fact conflict with some of the evidence we have.<sup>2</sup> Additionally, they commit Anaxagoras to holding problematic philosophical views. More recently, the discussion has received renewed attention from fresh suggestions made by Patricia Curd, and by Gareth Matthews in discussion with John Sisko. I group together the views of these three interpreters, even if they do not engage with each other directly, because they all share a *mass logic* approach to Anaxagoras's ontology—this is their central innovation. For them, Anaxagoras is thinking of (actually existing) masses of stuffs being present in composite things, in variable quantities, as impurities that are everywhere in the things in question. This line of interpretation, which I refer to as the Liquids interpretation, differs from the Particulate interpretation because it does not postulate the existence of small particles of definite size, and from the Proportionate interpretation because it does not postulate that the ingredients are present in potentiality only. As my own interpretation, as presented in chapter 3, assumes the divisibility of the opposites' instances (as per **NoLeast-P**), I also engage in this chapter with the line of interpretation according to which divisibility does no metaphysical work in

2. As others have also noted, Anaxagoras does not mention either particles or proportion anywhere in the extant text; but this is not the only, or even main, textual difficulty affecting these interpretations.

Anaxagoras's system. The present chapter as a whole engages with the main existing readings of Anaxagoras's principle that there is a share of everything in everything, aiming to offer further support for the substantial interpretative shift I introduced in chapter 3.

#### 4.1. THE PROPORTIONATE INTERPRETATION

In this and the following section of the present chapter I will review the Proportionate and Particulate interpretations, in turn. The Proportionate interpretation, in essence, takes every constituted thing in Anaxagoras's world to contain portions of everything else, where the portions are not present in each thing as distinct parts (or particles)—rather, they are present as *proportions* of kinds in a mixture.<sup>3</sup> On this interpretation, Anaxagoras is using small and large to indicate the quantitative proportion of an item within the local or global mixture in which it is present. For instance, “The ‘smallness’ of, say, gold [in the global mixture] consists not in its being divided into minute particles, but rather in the simple fact that there is very little gold in the world” (thus Barnes 1982 [vol. 1, revised]: 23). It follows on this reading that when in B1 things are said to be “not visible ‘on account of smallness’ it means something like ‘on account of the small proportion of most substances relative to the proportions of air and aether in the total mixture’; whereas ‘unlimited in smallness’ means something like ‘without limit on how small they [the substances] may be divided up’” (thus Schofield 1980: 77).<sup>4</sup> The last explanatory remark made by Schofield amounts to the claim

3. There exist many formulations of this interpretation in the literature; for instance, Schofield describes the Proportionate interpretation thus: “The ingredient portions of every sort of thing which are contained in each object or stretch of stuff of a given kind need not themselves take the form of parts individuated in the same general fashion as objects or stretches, nor need they be distributed among such parts . . . they are to be thought of simply as proportions” (1980: 75).

4. By “substances” Schofield means the opposites. On the use of the term “substance” in relation to Anaxagoras, I share Curd's concern voiced in (2010: 158, n. 11).

that, for Anaxagoras, there is no limit on how small the proportion in which something is present in something else might be. On the Proportionate interpretation, the primordial mixture is thoroughly homogeneous, as no ingredients in it can be individuated as such, as a part of the mixture. Attributing this view to Anaxagoras however commits him to a stance that is not, and cannot, be his, as it entails that the ingredients exist in mixtures only potentially, and not actually, and thus could change from being in potentiality to being in actuality in certain circumstances. On the Proportionate interpretation the homogenous primordial mixture would be like, e.g., seawater, that is, (pure) water and salt through and through. Seawater contains a certain proportion (but no actual parts) of (pure) water and of salt; on the other hand, salt and water can be retrieved from it, so they exist potentially in the mixture, and could transition to actuality. We are now in the position to see two fundamental problems with the Proportionate interpretation. First, on this interpretation, Anaxagoras would be thinking that all the elements at the primordial stage of the universe are potential only.<sup>5</sup> In addition to the “weakened” sense in which, on this interpretation, things would be in existence at the beginning of the development of the universe, the second and even more fundamental difficulty with the Proportionate interpretation is that the transition from potentiality to actuality presupposes the possibility of generation of something new, in a stronger sense than the Parmenidean strictures in play in Anaxagoras’s system allow, as we saw in chapter 1. In conclusion, the Proportionate interpretation appears to be wanting, on account of

5. In this connection, Schofield notes,

It might well be doubted whether the primordial state envisaged by the proportionate interpretation is pluralistic enough. The interpretation affirms, of course, a plurality of kinds, existing as proportions of the total mixture. But is that existence more than *potential*—a promise that once the cosmogonic revolution begins, different objects and stretches of stuff of different sorts will be separated out? . . . [T]heir existence is still *potential* in comparison with the robust actuality of the particles of the rival interpretation. (1980: 78)

these two main difficulties, and also on account of the absence of any explicit supportive textual evidence. We turn next to investigate the prospects of the Particulate interpretation.

## 4.2. THE PARTICULATE INTERPRETATION

The Particulate interpretation is not prey to the concerns raised by the Proportionate interpretation: for according to the former, the local and global mixtures contain actual ingredients as distinct parts or particles in them—and not only proportions, that is, ingredients in potentiality. Thus, on the Particulate interpretation, no passage from potentiality to actuality is posited. Hence both the local and global mixtures are heterogeneous, and not uniform (contrary to what the Proportionate interpretation postulates). Schofield reconstructs the considerations that motivate the Particulate interpretation thus:

In the beginning all things—i.e. all discrete individuals or bits of matter and all stretches of stuff (such as air and aither) which do not form discrete objects—were mixed together . . . as a single indistinct mass. . . . Anaxagoras may have thought that his acceptance (in F 17) of the Parmenidean interdict on the possibility of coming to be and perishing committed him to an original plurality of discrete objects and stretches: if you don't include an actual plurality in the original state of things, you will never be able to conjure one up at a subsequent stage. (1980: 70–72)

Additionally, the Particulate interpretation facilitates our understanding of how the ingredients can move around in space in virtue of the vortex initiated by *nous*; the moving around in space of proportions or potential entities is on the contrary difficult to make sense of. Generally, according to the Particulate interpretation, Anaxagoras uses *small* and *large* to indicate the actual physical dimensions of the



particles of the ingredients. In light of this, B1 is interpreted as saying, in Schofield's words, that

[in the original mixture t]here were different instances of different substances (and presumably of the same substance), but . . . these were too small or too indistinct to be discriminable by a human or animal eye. (1980: 68)

These are the main advantages of the Particulate interpretation. Nonetheless, there are also difficulties that have been raised against it in the literature. I will here review two important arguments that were put forward by Jonathan Barnes and Edward Hussey respectively, as they will help us to gain a deeper understanding of the constraints that a sound interpretation has to satisfy. I call them the Saturation Argument and the Containment Regress Argument.

#### 4.2.1. The Saturation Argument

This argument was developed by Barnes as a critique of the Particulate interpretation. It runs as follows:

If every piece of *S* contains a particle of *S*1, . . . then every piece of *S* is wholly composed of particles of *S*1—which is absurd. (1979: 255)

The challenge is that, in the spirit of Anaxagoras's own principles, for every part of *S* there must be a part of *S*1 within it. On what reasoning, then, does Barnes hold that if every piece of *S* *contains* a particle of *S*1, every piece of *S* is then *wholly composed* of particles of *S*1? Consider: suppose that in a piece of *S* there is a particle of *S*1. Then either the *S*1 particle will be the whole of the *S* piece, which would conclude Barnes's reasoning, or the *S*1 particle will be a proper part of the *S* piece, leaving an *S*-remainder piece.<sup>6</sup> If the latter, there will be a

6. The remainder piece will be a proper part of the original *S* piece, according to the weak Supplementation Principle of mereology (see, e.g., Simons 1987; Casati and Varzi 1999).

further S1 particle in the S-remainder piece, and it will either be the whole of the S-remainder, or a proper part of it, and so on. Ultimately, in Barnes's argument, the regress stops when there are no S-remainder pieces left in the S pieces, but only S pieces that are wholly<sup>7</sup> composed of S1 particles. Hence the charge of absurdity. But the validity of Barnes's argument depends in fact on some further background assumptions that he does not make explicit. His argument is sound if we assume that S1 particles are finite in size, and that S divides into ultimate parts in which S1 particles fit exactly.<sup>8</sup> Indeed, Barnes's argument addresses only finite divisions of the mixants, because he intends it as a critique of the Particulate interpretation, which does not envisage unlimited smallness of particles, but only extreme smallness. Yet Anaxagoras tells us explicitly with **NoLeast-P** that all things are unlimited in smallness. If this is so, contrary to the Particulate interpretation, the pieces of S are unlimited in smallness, and so are the pieces S1. In that case, Barnes's argument is not valid. The requirement, by hypothesis, that every piece of S contains a particle of S1 is satisfied, even if S1 particles are always taken to be proper parts of S pieces, leaving an S-remainder part, ad infinitum. In such a case, the conclusion that every piece of S is wholly composed of particles of S1 does not follow—there will always be smaller particles of S1 to fit pieces of S as their proper parts, leaving a proper part S-remainder. The Saturation Argument does not, as such, rule out this type of containment of one element in another. I now turn to explore whether such containment can satisfy the requirements of Anaxagoras's ontology, and consider the Containment Regress argument.

#### 4.2.2. The Containment Regress Argument

It might be thought that if one grants to Anaxagoras that all the elements are unlimited in smallness, which is what **NoLeast-P** states,

7. Since by hypothesis *every* piece of S contains a particle of S1.

8. If the particles of S1 did not fit exactly in the smallest pieces of S, the argument would not be sound; there would S-remainders with no S1 particles in them.

this would allow for a containment relation among the elements. On this hypothesis, each part of an element *S* would contain, not only a part of an element *S*1, but also a part of every kind of element there is in the ontology—of which, for Anaxagoras, there are many, if not unlimitedly many, kinds. Thus, given **NoLeast-P**, each piece of *S* would contain parts of *S*1, *S*2, *S*3, . . . as proper parts, while still leaving an *S*-remainder (since it is a piece of *S*), in every part of *S*, ad infinitum. Yet a different problem arises now, from the complexity of the structure of the contained elements. The difficulty comes about because it is not only *S* that contains parts of every type of fundamental element, but according to **EE-P**, every type of fundamental element contains parts of every type of fundamental element. What kind of structure emerges from the assumption of this type of containment? One that is barely intelligible. Expressing this thought, Hussey writes,

Within any lump of *X*, there is a “share” of *Y*. Either this “share” is present as a number of continuous packets, or not. If not, the visualisation fails already and it is hard to see how talk of *quantities* is to be justified. But if the “share” of *Y* is present in spatially continuous packets within *X*, there will presumably be “shares” of *X*, and everything else within the packets of *Y*, so that we are started on an infinite progression. This destroys the possibility of drawing any *definite boundary* between the *X* and the *Y* in the lump, be *X* and *Y* whichever ingredients they may, and this in turns *destroys the notion of a packet* with which the infinite progression has started. (1979: 137, my emphasis)

Hussey’s point is that if shares of each kind of stuff were within every share of every kind of stuff, the resulting configuration would lead to such a degree of structural complexity that, he concludes, we would lose track of the very notion of “contained unit.” If to this we add Anaxagoras’s proviso that each kind is unlimitedly small, with each unlimitedly small part containing a proper part of every kind of opposite, then the structure defies representation: each of the *infinitely*

many, infinitely divisible parts of each element contains proper parts of the *infinitely* many, qualitatively different kinds of element, with a remainder, and *each* of these (contained) proper parts contains proper parts of the *infinitely* many, qualitatively different kinds of element, with remainders, and so on ad infinitum (horizontally and vertically). This is not an infinite series of regressive steps. It is a series in which countless infinities “sprout” at each step, and in each item of each such infinity, further infinities “sprout,” and so forth. This complexity becomes incomprehensible within the first couple steps of reasoning. Because of this, it is plausible to rule out that this is what Anaxagoras’s ontology looked like. Even if one might want to entertain that Anaxagoras could accept a nonintelligible world, this interpretation is unsustainable. On the account of containment just sketched, there is nothing that could differentiate one kind of element from another. Thus the type of containment just envisaged undermines the intelligibility of any attempt to construe *different kinds* of element as *constituted* of every kind of element. By contrast, Anaxagoras’s ontology does require the fundamental building blocks to be of *different* kinds.<sup>9</sup> In conclusion neither the Proportionate nor the Particulate interpretation delivers a sound interpretation of Anaxagoras’s views—both are prey to difficulties, and neither sits well with the textual evidence. On account of these considerations, other attempts have been made in the scholarly literature. To these we now turn.

#### 4.3. THE LIQUIDS MODEL

The impasse in the debate between the Proportionate and the Particulate interpretation has more recently motivated a fresh discussion which develops the idea that the ingredients of things are

9. On my proposed interpretation, the fundamental building blocks of different kinds are the opposites. As we will see, they are not composed of each other nor do the mixtures of the opposites change their constitution.

present in them as *masses*, not as particles of definite size (as, for instance, in the case of a mixture of salt and pepper) nor as fused constituents (as in the case of sugar in a cake). This mass logic approach may be visualized by means of a liquids model. The idea has been explored since antiquity,<sup>10</sup> but it has been most recently and most fully developed by Patricia Curd. She describes this interpretative approach to Anaxagoras's **EE-P** thus:

The ingredients are like pastes or liquids; they are all mixed or smeared together such that all the ingredients are in every possible place in some concentration or other. Even though everything is unlimitedly small, and the mixture a thorough one, the mix need not be uniform; the concentrations of the various ingredients can vary in density or intensity in different places, but all of them have some non-zero density at every place. . . . We should think of the basic things as like liquids or pastes that flow together and occupy the same volume of space. (2010: 181, 184)

Note that liquids do not mix like salt and pepper, or like salt and water, or water and wine. Rightly, Curd is not appealing to the special way that *we* know liquids mix—which Anaxagoras would not have known—by *dissolving* one another's molecular bonds. Anaxagoras's fundamental elements cannot change one another, and they do not change, apart from their location. Rather, Curd finds in liquids a familiar example of how masses mix, which allows that the ingredients in the mix retain their own individuality (so they are not in the mixture only as potential entities), and yet that they can occupy the same space (so Barnes's Saturation Argument does not apply here). So on Curd's interpretation, what is it to be unlimitedly small, when recast in terms of masses? If their unlimited smallness facilitates the thoroughness of the mixture (as we know from Anaxagoras's line of

10. As we will see in chapter 6, the Stoics give water and wine as one of their examples of colocation.

reasoning in B6),<sup>11</sup> we need to understand what the units of, e.g., liquid are, ontologically. Are they collections of distinct unlimitedly small droplets? Curd explicitly rejects this line of thinking:

I don't think the particulate model is the correct interpretation. If Anaxagorean stuffs are not particulate, then "small" and "large," at least here in B3 and B6 (and in B1 and B2 as well), do not refer to the size of a piece or drop or bit of an ingredient. (2010: 183–84)

How are we then to understand the smallness of the ingredients on the Liquids model? Curd writes,

I take "small" and "large" in this context as a way for Anaxagoras to speak of submergence in and emergence from the background mixture of all things. (2010: 184)

Accordingly, she reads **NoLeast-P** as saying that "there is no limit on how submerged in the mix an ingredient can be" (2010: 184). For instance, gold in my flesh is very small, "I.e. its density is so low that it is submerged in the rest of the ingredients, and so it is not manifest" (2010: 184).<sup>12</sup> Before proceeding with the analysis of this last claim by Curd, I should mention that the Liquids model entails that the density of the ingredients cannot change. The reason is that liquids are not compressible, and so we cannot fit more of a liquid in a given volume of that liquid. For this model to help us understand

11. B6: "Since it is not possible that there is a least, it would not be possible that anything be separated, not come to be by itself, but just as in the beginning, now too all things are together" (ὅτε τοῦλάχιστον μὴ ἔστιν εἶναι, οὐκ ἂν δύναιτο χωρισθῆναι, οὐδ' ἂν ἐφ' ἑαυτοῦ γενέσθαι, ἀλλ' ὅπως περ ἀρχὴν εἶναι καὶ νῦν πάντα ὁμοῦ).

12. Curd adds that her interpretation is close to Inwood's, who defines "smallness" as "the characteristic of being mixed and so not distinguishable from other stuffs" (1986: 22). See also Curd (2010: 187): "I am not suggesting that by 'large' and 'small' Anaxagoras *means* 'emergent' or 'submerged.' . . . Rather, in certain cases we should understand that what it is for something to be small just is for it to be of such density

Anaxagoras's ontology, it would have to develop a conception of a liquid that could change in density. Without such a development of the model, when Curd talks about changes in the density of an ingredient in the mixture, this can only be in relation to the amount of any other ingredient in that mixture rather in relation to itself, by becoming more dense; this is in line with **P-P**, which refers to the amounts of ingredients in relation to other ingredients.<sup>13</sup> Now, to the concept of submergence. We should not take submergence to mean dissolving. This is because Curd wants the Anaxagorean ingredients to be recognizable as such, when they are manifest in sufficiently high concentrations. She does not want the ingredients to be potentially present in the mixture. In that sense she is not a proponent of the traditional Proportionate interpretation. But her ingredients are present in mixtures in certain proportions, as we saw in her example of gold in my flesh. To pay full justice to Curd's interpretation, we need to put together the claim that the ingredients do not dissolve in the mixture (namely, that they are not in potentiality in the mixture) with the claim that the terms "large" and "small" do not refer to the sizes of pieces or drops or bits of an ingredient. So if we think of her interpretation as being illustrated by, e.g., a water-and-oil mixture, how are we to think of the water and the oil in the mixture? It should be possible for either ingredient to be in a large proportion in relation to the other ingredient in the mixture, or in a small proportion. The difference in proportion between them could be so big that, for practical purposes, in the one case the mixture could be thought of as being water, with the oil submerged, and in the other it could be thought of as being oil, with the water submerged. Let us consider the mixture in

or concentration that it is submerged in the mix and so is not apparent or evident. Context must determine the appropriate sense." I see important differences between Curd's and Inwood's interpretation and I will discuss the latter in conjunction with Furth's (1991) as a distinctive interpretative proposal in section 4.4. of this chapter.

13. The only difficulty that might arise for Curd's stance on this issue is with Anaxagoras's claim that some ingredients can be compacted. For instance, "From the earth stones are compacted by the cold" (B16). This phenomenon would require a Liquids model that allows for density changes.

which the oil is submerged. The oil is not in the mixture in very small droplets, or bits, or pieces, as we know from Curd (quoted above).<sup>14</sup> Extrapolating from Curd's pastes simile (2010: 181), we could perhaps think of the liquids as being in the mixture as malleable bodies. The problem is that the differences in the oil and the water cannot be that here the oil is more dense than there, since liquids or pastes cannot vary in their densities in the proposed model; a mixture can contain more or less of one of them, but it would accordingly displace another liquid or paste. So the submergence of an ingredient could not be achieved by reducing its density in the mix.

I admit that I find it difficult to put together all the metaphorical descriptions of the Liquids interpretation given by Curd into an account that accommodates Anaxagoras's claims about the ingredients in the mixture. I also find it difficult to understand how the liquids can supposedly occupy the same volume of space in the mixture. We need to bear in mind that they do not dissolve one another, because then they would exist only potentially in the mixture. Similarly, pastes (that do not dissolve each other, thereby remaining only potentially in the mixture) do not occupy the same volume of space. Typically, when pastes or liquids get mixed together, they come to occupy together a volume that is the sum of the volumes that each of them occupied separately. If the pastes do not dissolve each other, then when mixed they must displace one another (rather than occupy the same space), and end up being juxtaposed (even if not in the same way as salt and pepper, because we are thinking here in terms of masses). In sum, I cannot see how one can derive the collocation of ingredients in the mixture through the Liquids interpretation.

A further difficulty I find with the Liquids interpretation is in its understanding of Anaxagoras's claim in B1. Given Curd's proposed understanding of "small," it follows that she would explain Anaxagoras's claim that in the original mixtures all things were

14. Strictly, Curd does not say that they are not in droplets, etc., but that by "small," Anaxagoras does not mean the size of droplets, etc.



unlimited in smallness as meaning that all things in the mixture were unlimitedly submerged, along the following lines:

In certain cases we should understand that what it is for something to be small just is for it to be of such a density or concentration that it is submerged in the mix and so is not apparent or evident. . . . In all three instances of the word here [i.e., in B1], “small” apparently has its specialized sense of “submerged.” (2010: 87)

What “unlimitedly submerged” would mean here is not perspicuous. For argument’s sake, let us take Curd’s view to be that for Anaxagoras all things in the original mixture were everywhere in unlimitedly small concentrations or densities. The question is: why would Anaxagoras want to make such a claim? All he needs for the original mixture to be as he describes it is that no ingredient is predominant, and hence (perceptually) evident. So each ingredient in the mixture has to be *small*, in the sense of being submerged in the mixture. But why should Anaxagoras want to additionally claim that each ingredient is *unlimitedly small* in the mixture? If we look closely at B1, we see Anaxagoras is reported to have made in fact two distinct claims:

[1] All things were together, unlimited in amount and in smallness, for the small, too, was unlimited. [2] And because all things were together, nothing was evident on account of smallness.

[1] ὁμοῦ πάντα χρήματα ἦν, ἄπειρα καὶ πλῆθος καὶ σμικρότητα καὶ γὰρ τὸ σμικρὸν ἄπειρον ἦν. [2] καὶ πάντων ὁμοῦ ἐόντων οὐδὲν ἐνδηλον ἦν ὑπὸ σμικρότητος

Claim [2] says that the ingredients are small and hence not evident. But claim [1] says that the ingredients are unlimitedly small, not *quae* nonevident, but because there is no limit to smallness. I submit that it is difficult to explain claim [1] on the submergence interpretation, because Anaxagoras explicitly holds in claim [2] that the smallness of the ingredients is sufficient for their nonevidence. So one has to

allow, with Curd, two senses of “small” (and “large”) in Anaxagoras’s text—in size, and in submergence.

We are not yet however in the position to assess the overall prospects of the mass logic approach that Curd develops, as this approach holds promise in some other respects. Gareth Matthews argues that this approach can help address a challenging problem in Anaxagoras’s ontology which arises from **EE-P**. How there can be qualitatively *different kinds* of things in an ontology where everything is in everything? The problem is generated by the combination of **EE-P** and **NoLeast-P** with **P-P**, which we examined in chapter 2. Specifically, is there room for **P-P** in an ontology governed by **EE-P** and **NoLeast-P**? Matthews (2002 and 2005), who implicitly adopts the same mass logic approach as Curd,<sup>15</sup> poses the problem in the following terms:

My watch chain is “most plainly” gold if, and only if, my watch chain contains more pure gold than anything else it contains. But, if [on account of **EE-P**] there is no such thing as pure gold, my watch chain will not contain more of that than anything else, there being no such thing as that. (2002: 1)

Note that Matthews does not assume that it is part of the nature of each ingredient of the mixture to contain other stuff as part of its constitution, as it was assumed in the Containment Regress argument in section 4.2. Rather, on Matthews’s reading, other kinds of stuff are mixed, as *impurities*, with each kind of stuff. On this assumption, Matthews proposes that we can, in Anaxagoras’s system, form the conception of a pure kind of stuff from the recognition that impure stuff can be purified, even if not completely, at least approximately. Thus, although it will never be the case that we will reach pure, e.g., gold, there can be purer and purer gold—refined gold. For example,

15. I am not here concerned with settling who was the first to put forward the mass logic approach to Anaxagoras’s ontology; it is interesting to note that Curd does not engage with Matthews’s views although her translation (2007) follows the publication of Matthews’s articles.

the mixture out of which Matthews's watch chain is made is that of a golden object because, although successive refinements of gold will never yield pure gold, they will increasingly converge on an amount of refined gold that will be greater than the amount of dross that will be generated by the refinement process. This gives us a way to think of the chain as being "most plainly" gold if, and only if, it contains more refined gold than dross, even if the refined gold is not quite pure.<sup>16</sup> In response to Matthews, and in response to an even more complex analysis (in Barnes 1982) and a further generalized version of the recursive refinement, John Sisko (2005) argues that on this reasoning the position we are left with is that

no process of recursive refinement—not monadic, not dyadic, not polyadic recursive refinement—can be used to determine specifically *how much* gold is in a bar of gold. Matthews's proposal fails, Barnes's proposal fails, and no other proposal that relies on recursive refinement can ever succeed. (2005: 244)

My own response to this line of interpretation is that Matthews assumes that the process of refinement filters *most*, even if not all, of the impurities out of an ingredient in the mixture. But Anaxagoras's elements are unlimitedly small, as per **NoLeast-P**. Anaxagoras also holds that the elements are unlimitedly large in amount, as per **NoLargest-P**—so what he means by their unlimited smallness is not their total quantity, which is unlimitedly large, but that they are each divided into unlimitedly small parts. As we saw in chapter 3, this means that their parts are as numerous as the points in a line:<sup>17</sup>

16. Matthews's proposal is also compatible with either the particulate or the proportionate model of explanation of the mixture. My discussion of his position here will not address either of these two versions one could develop of Matthews's arguments, since both the particulate and the proportionate interpretations have been found problematic in the scholarly literature, as reviewed in sections 4.1 and 4.2 above.

17. This is of course only an analogy, since points are not parts of a line; the important aspect of the analogy is the numerosity of the points, rather than their ontological status.

if a mixture of *r* and *g* is like the overlap of a red and a green line, the notion of refining the red line by filtering *most* of the green points out of it would not be applicable—there would always remain as many green points in it as we started with. Explaining the preponderance of elements in a mixture in view of their unlimited smallness may be more Anaxagoras's problem than Matthews's, but it follows that, given the unlimited smallness of the mixants, Matthews's recursive refinement cannot explain the preponderance of Anaxagorean (continuum dense) mixants.

#### 4.4. THE NO-DIVISIBILITY INTERPRETATION

I will finally examine an existing alternative interpretation that most directly contrasts with mine, and that has been put forward with interesting arguments in the recent secondary literature. At the core of this alternative is the thought that Anaxagoras did not think at all in terms of infinite divisibility of the fundamental items in his ontology, but rather in terms of composition and segregation of mixtures, in line with his contemporary Empedocles. On this alternative interpretation, Anaxagoras qualifies the elements as "small" when intending to indicate that they are in a state of mixture, and thereby imperceptible. I call this the No-Divisibility interpretation. In Brad Inwood's words, "There is no need to posit infinite divisibility for Anaxagoras" (1986: 18).<sup>18</sup> Although a number of scholars hold this view, I here limit myself to engaging with the work of Brad Inwood (1986) and Montgomery Furth (1991), with reference also to Malcolm Schofield (1980) as a representative selection. I cannot fully pay justice here to each version of the No-Divisibility

18. Part and parcel of Inwood's line of argument in support of the nondivision interpretation is the view that "it is historically implausible that he should have conceived of infinite divisibility" (1986: 32–33). My response to this strand of the argument leans on Mansfeld's (1979) studies of the historical data, in particular in respect of the relation between Anaxagoras and Zeno; see also the appendix to this chapter.

interpretation that each of these scholars has developed. In lieu of that, I will respond to their common line of thinking by focusing on Anaxagoras's own arguments which make clear, in my view, the metaphysical work that divisibility does in his system, and why divisibility is needed for Anaxagoras's desired conclusions. In doing this, I will discuss some representative alternative readings of the relevant texts put forward by the proponents of the No-Divisibility interpretation, and show where they do not sit well with the extant evidence.

The thrust of the No-Divisibility interpretation is that "smallness" means being mixed, and "largeness," being manifest. Furth, for instance, puts the claim in these terms:

[Anaxagoras's] notions of Large and Small have a theoretical application which is distinct from . . . their ordinary-life application to spatial size, and in particular they have nothing to do with infinite divisibility as everyone from Aristotle on has thought. (1991: 97)

Yet, looking at Anaxagoras's texts and the reasoning of his arguments, it is very difficult to imagine how one can understand them merely in terms of mixture and manifestedness. Consider, for instance, B5 (which we discussed at length in chapter 3):

Even though these things have been dissociated in this way, it is right to recognize that all things are in no way less or more (for it is impossible that they be more than all), but all things are always equal.

Τούτων δὲ οὕτω διακεκριμένων γινώσκειν χρή, ὅτι πάντα οὐδὲν ἐλάσσω ἐστὶν οὐδὲ πλείω (οὐ γὰρ ἀνυστὸν πάντων πλείω εἶναι), ἀλλὰ πάντα ἴσα αἰί.

Separation does not make what they are separated from less, since it is unlimited, or make their totality less, since the totality remains the same. Importantly, increasing their *number* by the separation does *not* make them more, since the *total amount* remains the same.

Although in the final justification Anaxagoras says that “it is impossible that they be more than all,” he could have also added, for the sake of symmetry, that it is impossible that they be less than all. Generally, I take Anaxagoras’s argument to be that any division does not increase or decrease the total. By contrast, Furth explains the reasoning in Anaxagoras’s argument thus:

Changes in the manifestness or “largeness” do not involve any change in the number of the properties, which is a primitive, fixed given, already at the absolute maximum. I think some such thought is the obvious moral of fragment 5, a very pretty piece of reasoning about the place of “less” and “more”: **It is necessary to recognize that all things are not in any way less . . . or more . . . (“for it cannot be accomplished” that there be more . . . than all) . . . but all things are always equal.** (1991: 118, boldface in the original)

Let me first note that, if this is what Anaxagoras is saying here, namely that when something becomes large and manifest its number does not change, it is not clear why Anaxagoras would think he needed to state it at all—this is an evident and uncontroversial point. Second, when Anaxagoras says διακεκρίμενον, even if he had meant “manifest,” he could not have reasoned as Furth says he does. The reason why becoming manifest would not have increased the number of properties is not that their number is fixed as a constant in nature and that it is at an absolute maximum. Rather, the reason why becoming large and manifest does not change its number is that it is only a change in size—the now large and manifest was before smaller and unmanifest.

Turning now to Furth’s rendition of what he refers to as a “very pretty piece of reasoning,” contrast the way Furth reports the argument above and how the full argument reads in the original fragment B5. In reporting the argument, Furth leaves out its initial assumption: “Even though these things have been dissociated in this way.” Furth understands this assumption as saying that things

become manifest, which of course does not make them “less or more.” Importantly, the omission changes the line of reasoning in Anaxagoras’s argument. Whereas Anaxagoras is exploring in the argument what happens to the quantity of a thing when increasing its number by dividing its quantity, Furth reverses the logic of it, as if Anaxagoras examined what happens to the number of a thing when its quantity increases, which is not problematic. By contrast, Anaxagoras is investigating the relation of the number of a thing to its total quantity, rather than its size, and concludes that division increases the number, but does not change the quantity. The significance of the argument’s conclusion is lost in Furth’s rendition of Anaxagoras’s reasoning, which may partly explain why Furth does not see the relevance of division in Anaxagoras’s ontology. I will not pursue the discussion of Furth’s interpretation further here.

Brad Inwood on the other hand reads a tautology in Anaxagoras’s argument in B5:

Each one is always equal to itself, being neither less nor greater than it is. It is better to see this as repeating the main point of fragment 3, that each *χρῆμα* has equal bigness and smallness, rather than to take it as merely saying tautologically that there are as many kinds of *χρηματα* as there are. (1986: 30–31)

This is a surprising conclusion, since Inwood’s translation of the argument is this: “These things having been distinguished thus, one must recognize that all are in no way lesser or more” (1986: 30). The apodosis by itself is tautological, but there is also a hypothesis that must be taken into account. Anaxagoras is not considering how things are, as such, but what happens when, to use Inwood’s translation, “these things have been distinguished.” What difference does distinguishing these things make, to Inwood’s mind, which leads Anaxagoras to wonder whether distinguishing them makes things lesser or more? The answer is not perspicuous.

An additional difficulty with Inwood’s version of the No-Division interpretation is this: how are we to understand Anaxagoras’s claim

(in Inwood's translation), "Nor is there something which is itself the least of the small"? Inwood proceeds to offer this explanation: "On my hypothesis this states that there is no limit to how thoroughly things can be mixed" (1986: 29). But what is a thorough mixture? Inwood does not explain. In lieu of an explanation, he associates smallness with thorough mixture:

I would hypothesize that the smallness, for the *χρήματα* [pairs of opposites, wet-dry, hot-cold, etc.], is simply the condition of being thoroughly distributed in the mixture. There need be no reference to the size of discreet particles, as the traditional theory requires. (1986: 24)

Let us assume, with Inwood, that being thoroughly mixed is being thoroughly distributed in the mixture. The question is: what does it mean to be thoroughly distributed? One hypothesis could be that it means being everywhere in the mixture. But in what sense is something that is everywhere small? Where then would what is large be, and how would it be different from the small? In what sense is the small distributed? Is this an articulated entity that is scattered, or is it a continuous entity? If articulated, into what? If continuous, in what sense is it mixed with other such continuous entities in the same regions, namely, everywhere? Finally and importantly, if an item is everywhere when thoroughly distributed, how can there be degrees of it? How can we understand that there is "no limit to how thoroughly things can be mixed"? I will not pursue the investigation of the No-Division interpretation further, as I believe that the difficulties I have raised for it make it clear that it is not a promising interpretation.

#### 4.5. CLOSING REMARKS

We saw that Anaxagoras likes his paradoxes—he says, for instance, in B1 that each of the opposites, e.g., the hot, the dry, etc., is



unlimitedly large and unlimitedly small. Their largeness is generally understood as the total amount of each opposite in the universe. Their smallness has been interpreted in the scholarly literature in different ways, namely in terms of there being very small particles (or masses), or very small proportions of each type of thing in the extreme mixture of everything in everything. The conclusion we are in the position to draw at this stage, having examined the main interpretations existing in the literature, is that we cannot understand Anaxagoras's ontology, as governed by **EE-P**, **NoLeast-P**, and **P-P**, in terms of elements (whether conceived as particles or as mass) *containing* one another ad infinitum, or as somehow merged into a blend in which the elements are present as proportions. Recall Hussey's Containment Regress argument, to the effect that Anaxagoras does not have the conceptual tools to preserve the qualitative differences among kinds of stuff, if each contains all the others, because they all become constitutionally "fuzzy." I submit that the argument applies to *any* interpretation that reads **EE-P** as a relation of containment, whether we think of proportions or masses or particles.

Could we really understand the Anaxagorean mixture if it had such a structure? If each type of thing contained in its constitution every other of the infinitely many types of thing that exist in Anaxagoras's ontology, the mixture would become *unimaginably* complex, and on account of **NoLeast-P**, it would be impossible to differentiate between different kinds of thing. The structure of matter would be of at least aleph-1 complexity—that is, it would have at least aleph-1 regresses, of aleph-1 cardinality each. Every part of, e.g., gold would be divisible into aleph-1 parts of gold, each of these parts would contain bits of aleph-0 kinds in it, and each bit would have aleph-1 parts of its *own* kind, each of which would be further divisible . . . and so on and so forth. A regress of unimaginable complexity follows. Hence, we cannot begin to understand difference in kind between these things.

My conclusion is that the problem in so understanding Anaxagoras's ontology lies in the notion of constitutional *containment*. We need a fresh start. My proposal as presented in chapter 3 draws on a largely overlooked part of the textual evidence, where Anaxagoras phrases **EE-P** in terms of the elements that make up his ontology as being *compresent* with one another, rather than as *contained* in one another. It offers an account of Anaxagoras's ontology that is *not* based on constitutional containment, but rather necessary compresence of the opposites, facilitated by the fact that the opposites exist as divided gunk.

#### 4.A. APPENDIX: ZENO'S ARGUMENT FROM MULTITUDE

Controversy has developed in the secondary literature on whether Anaxagoras was responding to Zeno's arguments, or Zeno to Anaxagoras's. John Palmer (2009) recently argued that Anaxagoras was responding to Zeno, and I here adopt this line as my working hypothesis.<sup>19</sup> One of the arguments that Zeno of Elea developed is of particular relevance to our understanding of Anaxagoras's ontology at this stage of our investigation. The argument, an ancestor of the Bradley's regress, is this:

If there are many things, entities are unlimited; for there are always other entities between entities, and again others between those. And thus entities are unlimited.<sup>20</sup>

εἰ πολλὰ ἐστίν, ἄπειρα τὰ ὄντα ἐστίν· ἀεὶ γὰρ ἕτερα μεταξύ τῶν ὄντων ἐστί, καὶ πάλιν ἐκείνων ἕτερα μεταξύ. καὶ οὕτως ἄπειρα τὰ ὄντα ἐστί.

19. There is evidence that Anaxagoras had an even more sophisticated understanding of the infinite than Zeno, insofar as Zeno believed, but Anaxagoras rightly did *not* believe, that if the many things are just as many as they are, they are *finitely* many. Many things can be just as many as they are and be infinitely many, since being infinitely many is not the outcome of change, e.g., of increase in number, as Zeno thought. See, for instance, Palmer (2009: 245–46). For more on the issue of Anaxagoras's dates as such see Mansfeld (1990).

20. Fragment 3, in Palmer's (2009) translation.

It is here not possible to pay justice to the argument as such and the important scholarly discussion that centers on it. Palmer (2009: 243 ff.) suggests that Anaxagoras was influenced by this Zenonian argument, and thinks it makes sense to suppose that Anaxagoras would have conceived of **EE-P** in terms of a *containment* relation among elements, precisely in reply to Zeno's argument. Palmer explains, in support of this interpretation, that if each element contained parts of every element, this would avoid commitment to the separateness and distinctness of each element from the others. If the elements are neither separate nor distinct from one another, they are not vulnerable to the Zenonian regress above, because they are not many; hence, there are no in "between" entities, since the elements are not separate and distinct. By contrast, on my interpretation of Anaxagoras, his physical system can resist the Zenonian regress on account of the compresence of the elements, rather than on account of their mutual containment.

In thinking about whether the containment or the compresence interpretation avoids the Zenonian regress, my concern is with the density of the continuum. One can distinguish a point, and individuate it, as we do in mathematics, but can the point be separate from other points? I gave reasons to doubt that it can (in section 3.1.2). One can think of a part that is distinct and separate in a whole, e.g., a student in a class; and an entity can be distinct and separate from another entity it overlaps with; e.g., the neutrinos that go through us all the time are distinct from us, even while they momentarily overlap with us. But in neither case is there an assumption of continuum density. Zeno's argument does not explicitly specify either distinctness or separateness, but only the multitude of the entities. Furthermore, there is no conclusive historical and/or textual evidence that Anaxagoras was developing his ontology as an answer to Zeno's argument from multitude quoted above. It suffices to note here that even if Anaxagoras was responding to Zeno's argument from multitude with his cosmic mixture of elements, we have found no reason to assume that this led him to favor the containment over the compresence interpretation, or even vice versa.

## Intelligent Powers

Abiding by Parmenides's strictures, Anaxagoras allows for spatial movement, congregation, and separation as the only types of "real" change in the universe, and the only "real" causes of any other type of change. What powers them? How is movement generated? Anaxagoras posits a single *cosmic* source of movement in the universe. He makes *nous* this source: all movement of cosmic proportions originates from *nous*, directly, or indirectly through the vortex that *nous* originates.<sup>1</sup> The vortex is responsible for the spatial movement of opposites, and hence for their preponderance, which gives rise to stuff of different kinds. Hence the capacity of *nous* to move spatially specific opposites via the vortex gives *nous* the ability to "generate" stuff.<sup>2</sup> In making *nous* the single source of cosmic movement Anaxagoras combines in it movement (and so change at the cosmic level) with intelligence. *Nous* is an intelligent power. As we will see in the present chapter, Anaxagoras provides an account of reality whereby a cosmic intelligence, *nous*, develops the world according to its conception of order, from what is primitively given in it. This is Anaxagoras's teleology. (Plato, in the words of Socrates,

1. B12: "And *Nous* controlled the whole revolution, so that it started to revolve in the beginning" (καὶ τῆς περιχωρήσιος τῆς συμπάσης νοῦς ἐκράτησεν, ὥστε περιχωρῆσαι τὴν ἀρχήν).

2. Selecting to move specific opposites presupposes a discerning cognitive ability of *nous*. As we will see in this chapter, Anaxagoras does attributes to *nous* knowledge and discernment about everything there is. *Nous*'s omniscience places requirements on its ontological constitution, spatial extent, and location in the universe. These requirements on the ontology of *nous* will be examined in detail in the present chapter.

finds this teleology wanting, because he would have wanted to see in Anaxagoras's account of reality everything, including what is primitively given it, to be for the good.)

Is *nous* alone causally responsible for *all* change in the universe, according to Anaxagoras? I believe that Anaxagoras thought that this is *not* the case. He does not seek to give an account of the world where everything derives from the good, or from a god.<sup>3</sup> Rather, Anaxagoras thinks of the relation between *nous* and the world we live in along the model of farming, to use an apt characterization given by Sedley (2007).<sup>4</sup> Farmers do not create everything in the farm (the soil, the weather, the seeds for the new crops, etc.) — rather, they put to use and look after the existing resources in the farm. Similarly with *nous*—it does not create all the powers for change in the cosmos. Rather, *nous* operates at the *cosmic* level, setting the world order within which *local* powers for change operate. Such local powers are not created by *nous*, but preexist in the primordial mixture, and they include the opposites<sup>5</sup> as well as biological seeds. As I will argue in this chapter, living organisms are physically as well as diachronically structured.<sup>6</sup> The special and high complexity of structure that characterizes them cannot be accounted for by ratios of opposites (which is what accounts for stuffs). Anaxagoras includes the seeds in his ontology precisely as the source of such complexity—the seeds are *powers for life*. They are causally responsible for the highly complex structural developments of living being, and in this sense they (too) are intelligent

3. This is a conception that we find in Plato, and frequently after Plato, but not in Anaxagoras.

4. Sedley writes: “*Nous* is a farmer. Its creation of worlds is its way of setting up environments which will enable seeds to germinate, with plant and animal life the outcome” (2007: 23).

5. We saw in chapter 1 that the opposites are a secondary or local source of power in the universe; we see them in action, for instance, in B16, where the cold is said to compact earth into stones. They could be thought of as being the sources of physical necessity in Anaxagoras's system.

6. Individual organisms are even able even to procreate other individuals of the same species; this feature adds further complexity to the way they are structured.

powers. The present chapter is devoted to the study of intelligent powers in Anaxagoras's system: *nous* and the seeds.

## 5.1. THE UNMIXED STATUS OF *NOUS*

The most distinctive feature that Anaxagoras attributes to *nous*, which sets it apart from everything else in its system, is that it is the only type of entity that is not mixed with any other type of entity. Anaxagoras states in B11, "In everything there is a share of everything except *Nous*" (ἐν παντὶ παντὸς μοῖρα ἔνεστι πλὴν νοῦ, ἔστιν οἷσι δὲ καὶ νοῦς ἔνι). This claim is repeated for instance in B12: "The other things have a share of everything, but *Nous* . . . has been mixed with no thing, but is alone itself by itself" (τὰ μὲν ἄλλα παντὸς μοῖραν μετέχει . . . ἀλλὰ μόνος αὐτὸς ἐφ' ἑαυτοῦ ἔστιν). From the fact that it is not composed of them, it follows that *nous* is featureless with respect to the opposites. As discussed in chapters 1 and 2, things become characterized by determinate features, *modulo* perception, when there is preponderance of some opposites in them. Hence, although being mixed with opposites by itself does not make the thing in question characterized with any opposites,<sup>7</sup> being mixed is a precondition of preponderance, and preponderance is what determines what characteristics something has.

Is *nous* completely featureless? In B12 we read that *nous* "is the finest of all things and the purest" (ἔστι γὰρ λεπτότατόν τε πάντων χρημάτων καὶ καθαρώτατον). On this description, the opposite fine and the opposite pure characterize *nous*. So *prima facie* it appears that *nous* is characterized by some opposites—if so, it would be an exception to the preponderance principle that governs everything

7. For even the primordial mixture, which includes all opposites, is not characterized by any of the opposites, due to their equipotent mixture. For instance, in B4b we read, "Before there was separation off, because all things were together, there was not even any colour evident; for the mixture of all things prevented it, of the wet and the dry" (πρὶν δὲ ἀποκριθῆναι [ταῦτα] πάντων ὁμοῦ ἔόντων οὐδὲ χροὴ ἔνδηλος ἦν οὐδέμια ἀπεκάλυε γὰρ ἢ σύμμιξις πάντων χρημάτων, τοῦ τε διεροῦ καὶ τοῦ ξηροῦ).

else in Anaxagoras's system. This invites closer examination of the claim in B11 that "in everything there is a share of everything except *Nous*." This claim may be given a strong reading (to the effect that *nous* is not mixed at all), but also a weak one (*nous* is not a mixture of everything in the way in which all other things are). The latter reading would allow us to explain the fineness and the purity of *nous* without presupposing its mixture with all opposites. The advantage of this weak reading is that it would offer an explanation generalizable also to other features of *nous* mentioned by Anaxagoras elsewhere, for example, in B12, that it is "unlimited and self-ruling" (νοῦς δὲ ἐστὶν ἄπειρον καὶ αὐτοκρατὺς). Yet in the very same fragment B12 there is evidence that the strong reading is what captures Anaxagoras's position: "*Nous* has been mixed with no thing, but is alone itself by itself" (καὶ μέμικται οὐδενὶ χρήματι, ἀλλὰ μόνος αὐτὸς ἐφ' ἑαυτοῦ ἐστίν). This sets an absolute condition for the constitution of *nous*—it is not at all mixed. How then does *nous* possess its features, if not by being mixed with them? We could suppose that such features as being refined, pure, unlimited, and self-ruling are *second order* properties, which Anaxagoras does not reify in the ontology, as if they were second-order descriptions of the nature of *nous*. On this proposal, the features Anaxagoras attributes to *nous* would be of a different type from the opposites.<sup>8</sup> How so? They would not qualify anything else but *nous*. This however can only remain a speculation, because nowhere in the extant texts do we find it stated that such features as being refined, pure, unlimited, and self-ruling differ from the opposites, or how they differ.

There is a further characterization that Anaxagoras gives of *nous* that is relevant to the present discussion and that we need to examine. In B12 Anaxagoras tells us that *nous* divides into large and small portions: "All *Nous* is alike, both the greater and the smaller" (νοῦς

8. If the features that characterize *Nous* were of the same type, being mixed with them would bring all other opposites into the constitution of *nous* because of the inseparability of opposites; thus Anaxagoras holds in B12 that *nous* cannot be mixed with anything, for reasons that we will examine below.

δὲ πᾶς ὁμοίος ἐστὶ καὶ ὁ μείζων καὶ ὁ ἐλάττων). Presumably these are the portions of *nous* in large and small animate beings, as in the same text Anaxagoras also says, “*Nous* has control over all things that have soul, both the larger and the smaller” (καὶ ὅσα γε ψυχὴν ἔχει καὶ τὰ μείζω καὶ τὰ ἐλάσσω, πάντων νοῦς κρατεῖ). The division of *nous* in small and large portions entails that the opposites large and small characterize *nous* in the animate beings. Hence *nous* is mixed with the opposites large and small. But how does this square with what has been said so far about its unmixed nature? In the very same passage, in B12, Anaxagoras tells us that the nature of the large and small portions of *nous* is the same as the nature of the cosmic *nous* (because *nous* is all alike). Hence, the *nous* of the animate beings is *not* mixed with opposites large and small any more than the cosmic *nous* is mixed with them. How then are there large and small portions of *nous*? I offer here a speculative suggestion by way of analogy, as Anaxagoras does not give us any explicit answer to this question. Consider a landscape where we see grass everywhere, but can refer to the grass on the hillside, the grass in the valley, the grass with the patch of sun falling on it, etc. The grass is one, but there are ways of referring to regions of it that do not divide the grass except only referentially. We might speculate that the association of *nous* to animate beings is of a similar kind for Anaxagoras. We know from B14 that *nous* is everywhere.<sup>9</sup> But perhaps Anaxagoras is thinking that we can single out and refer to special regions in space where *nous* is, e.g., in animate beings, without thereby dividing *nous* metaphysically. On this reading, referring to *nous* as being in special locations does not necessitate the mixture of the great and the small with the nature of *nous*.

In conclusion, Anaxagoras appears to give some physical attributes to *nous*. On the other hand, he offers no explanation of how

9. B14: “*Nous*, which always is, most assuredly is even now where all the other things also are, in the surrounding multitude, and in the things that were joined together and in the things that have been separated off.” I will return to a detailed discussion of this passage in section 5.2.



they come to characterize *nous*, and why this is not incompatible with the unmixed nature of *nous* that he sets as a necessary condition for *nous*'s knowledge and control of everything else. In B12 we find clearly stated,

The other things have a share of everything, but *Nous* . . . has been mixed with no thing, but is alone itself by itself. For if it were not by itself but had been mixed with anything else, then it would partake of all things, if it had been mixed with anything . . . ; and the things mixed together with it would thwart it, so that it would control none of the things in the way that it in fact does, being alone by itself.

τὰ μὲν ἄλλα παντὸς μοῖραν μετέχει . . . καὶ μέμικται οὐδενὶ χρήματι, ἀλλὰ μόνος αὐτὸς ἐφ' ἑαυτοῦ ἐστίν. εἰ μὴ γὰρ ἐφ' ἑαυτοῦ ἦν, ἀλλὰ τεφ ἐμέμικτο ἄλλῳ, μετεῖχεν ἂν ἀπάντων χρημάτων, εἰ ἐμέμικτό τεφ . . . καὶ ἂν ἐκώλυεν αὐτὸν τὰ συμμεμειγμένα, ὥστε μηδενὸς χρήματος κρατεῖν ὁμοίως ὡς καὶ μόνον ἔοντα ἐφ' ἑαυτοῦ.

What we want to turn to now is the question of why things mixed with *nous* would thwart it and prevent it from controlling the things that it in fact controls, it being not mixed with them. To understand the reason, we need to briefly introduce an aspect of Anaxagoras's account of perception, which previous interpreters have not studied in any specific connection with Anaxagoras's stance regarding the unmixed nature of *nous*.<sup>10</sup> Theophrastus reports that

Anaxagoras says that perception occurs through opposites, for the similar is unaffected by the similar. . . . Touch and taste make distinctions in the same way: something that is hot and cold to the same degree neither heats nor cools when it is near something else, nor do we recognize sweet and bitter by these

10. On Anaxagoras's account of perception, to which I cannot pay full justice here, see among others Warren (2007a) and Curd (2010: 225–29).

qualities themselves, but cold is perceived by hot, fresh by brackish, sweet by bitter. (*De Sens.* 27; *Dox.* 507)

Ἄ. δὲ γίνεσθαι μὲν (τὰ αἰσθ.) τοῖς ἐναντίοις· τὸ γὰρ ὁμοιον ἀπαθὲς ὑπὸ τοῦ ὁμοίου . . . τὸν αὐτὸν δὲ τρόπον καὶ τὴν ἀφήν καὶ τὴν γεῦσιν κρίνειν· τὸ γὰρ ὁμοίως θερμὸν καὶ ψυχρὸν οὔτε θερμαίνειν οὔτε ψύχειν πλησιάζον οὐδὲ δὴ τὸ γλυκὺ καὶ τὸ ὀξύ δι' αὐτῶν γνωρίζειν, ἀλλὰ τῷ μὲν θερμῷ τὸ ψυχρόν, τῷ δ' ἀλμυρῷ τὸ πότιμον, τῷ δ' ὀξεῖ τὸ γλυκὺ.

From this testimony, it appears that the fundamental intuition that drives Anaxagoras's conception of perception derives from the empirical phenomenon of blind spots. The thought, if extended to *nous*, is that if *nous* were mixed with something else, and even constituted by the predominance of some of the opposites, it would not be able to have control over these opposites, any more than a sense organ can discern the opposites that qualify it. For instance, the presence of the hot or the wet, etc., in *nous* would prevent it from being able to control (e.g., to separate off) the hot or the wet in the universe. By generalization, it is by being unmixed that the *nous* knows everything else.<sup>11</sup> It follows that being unmixed is a necessary condition for *nous* to be capable of controlling

11. If being different in nature is what allows *nous* to know and control everything else, one might think that this condition prevents *nous* on the one hand from knowing itself and being self-ruling (see B12); and on the other from knowing and controlling animate beings where small portions of *nous* are present (B12). These would be undesirable consequences for Anaxagoras. These difficulties however arise only if we presuppose that the way *nous* causally interacts with itself is the same as the way it interacts with the opposites, through the vortex. We have no reason, and it is in fact implausible, to think that this is the case. As Sedley emphasizes, *nous* cannot be taken to be on a par with other kinds of physical stuffs for Anaxagoras:

To call intelligence [*nous*] unmixed is his [Anaxagoras's] way of saying that it is *free of physical properties*. Anaxagoras is never reported as distinguishing mind or intelligence from body as the "incorporeal" from the corporeal, and indeed he betrays just the opposite assumption when he calls the *nous* "the finest and purest of all things," and when, later in B12, he speaks of it in quantitative terms ("nous is all alike, both the larger and the smaller"). He thus treats it as if it were a physical stuff, albeit a very special one. (2007: 12)

everything else. Anaxagoras must be conceiving of the unmixed nature of *nous* as being the *opposite* of the mixture of every thing in the universe. Being pure also entails that *nous* is the opposite of every single kind of opposite, not only of their mixture.<sup>12</sup> In conclusion, being unmixed, *nous* is the greatest power in the universe (ισχύει μέγιστον, B12), and its nature consists of cognitive and of controlling powers.

## 5.2. THE STRUCTURE AND OPERATION OF *NOUS*

In the preceding section I argued that Anaxagoras must be conceiving of the unmixed, pure nature of *nous* as being the opposite of the mixed and impure nature of everything else in the universe. That *nous* is purest indicates that whatever its nature, this is what it is through and through in its constitution. Anaxagoras claims this explicitly in B12: “All *Nous* is alike, both the greater and the smaller” (νοῦς δὲ πᾶς ὁμοίός ἐστι καὶ ὁ μείζων καὶ ὁ ἐλάττων). That “All *Nous* is alike” and not characterized by any opposites might be taken to suggest that *nous* is uniform, at least with respect to its physical constitution. Yet *nous* has cognitive powers in virtue of which it knows and discerns everything (B12: πάντα ἔγνω νοῦς), and thus exercises control in the universe (B12, *passim*). How does *nous* perform these cognitive activities? Intuitively, such activities presuppose that *nous* is somehow structured. Minimally, one might think, *nous* is a bundle of cosmic and cognitive powers. Since there are hierarchies and dependencies among the operations of these powers, there must be some structure in the constitution of *nous* underpinning them. We will also see in what follows that there are further considerations for attributing structure to *nous*.

12. The conception of the pure nature of *nous*, unmixed with any of the opposites, enabling it (as a necessary condition) to control everything suggests a *physical* power whose characterlessness empowers it.

How uniform is *nous*? We know from B12 that of *nous* there is “the greater and the smaller.” Does this mean that *nous* comes in individual instances, greater and smaller ones. And if so, how are they individuated? Is a greater *nous* a reference to *qualitative* or to *quantitative* superiority over a smaller *nous*? These questions give ground for speculation. For present purposes we want to note that even though we have no explanation from Anaxagoras of what individuates the instances of great and small *nous* (if instances they are), such differentiation into greater and smaller opens up the way for *nous* to be somehow structured. Let us pursue this thought further. In section 5.1 I suggested that perhaps Anaxagoras thinks of large and small portions of *nous* as individuated by reference only, rather than by ontological division (to avoid that *nous* is mixed with the opposites large and small). Would this type of differentiation of *nous* be sufficient to ground some operational complexity in *nous*? Could it be that *nous* is somehow operationally and functionally structured, but not constitutionally structured? Any answer to these questions would involve speculation.<sup>13</sup>

In absence of firmer evidence, we can only conclude that Anaxagoras does not have any explicit account of the mechanism by which *nous* operates. We saw that the various operations of *nous* require at least organizational structure, which must be somehow grounded on its nature. What creates a problem is that structure requires parthood of some kind. On one understanding of Anaxagoras’s views, he is committed to having the opposites large and small mixed with *nous*, which is incompatible with his claim of

13. Alternatively, should we think of *nous* as extended, so that its instances can be large or small? On the latter hypothesis, if *nous* is extended, **NoLeast-P** applies to it and *nous* is gunky, as the opposites are. This conclusion would sit well with Anaxagoras’s qualification of *nous* as the “finest” of all things (λεπτότατον) in B12, as the term λεπτός is a natural way to describe ash and dust, whose cloudy fineness and smallness suggest gunk. Furthermore, **P-P** would apply to *nous* as well. *Nous*, being gunky, would be the type of entity that could be preponderant in some regions in relation to the way it is in other regions, and this could even be used to explain the individuation of different kinds of *nous* instances in nature.

the purity of the nature of *nous*. On another interpretation, *nous* is not constitutionally structured, but structured only by way of how it is referred to. On a third interpretation, *nous* can be large or small but these opposites are not of the same kind as the physical opposites hot, cold, wet, etc. In that case, the instances of *nous* being large or small is not incompatible with *nous* being free of admixture with the physical opposites.

We are, on the other hand, able to say more about the operation of *nous* in the universe. In addition to the physical descriptions discussed above in sections 5.1 and 5.2, in B14 *nous* is said to be located in space, everywhere:

*Nous*, which always is, most assuredly is even now where all the other things also are, in the surrounding multitude, and in the things that were joined together and in the things that have been separated off.

ὁ δὲ νοῦς, ὃς ἀεὶ ἐστί, τὸ κάρτα καὶ νῦν ἐστὶν ἵνα καὶ τὰ ἄλλα πάντα, ἐν τῷ πολλῷ περιέχοντι καὶ ἐν τοῖς προσκριθεῖσι καὶ ἐν τοῖς ἀποκεκριμένοις.

Although not explicitly stated, the physical condition of *nous* being everywhere indicates that for Anaxagoras, physical compresence of *nous* with all the things must be a condition of *nous*'s control of them (and knowledge of them, as we will see in section 5.3). We will come shortly to the reason why this is the case. Additionally, in B11 we read that “there are some things in which *Nous*, too, is present” (ἐστὶν οἷσι δὲ καὶ νοῦς ἔνι). It is plausible to infer from these two texts, B11 and B 14, that *nous* is present in some things in a different way from that in which it is present in everything. In B12, Anaxagoras indicates that *nous* has a special relation to some things: “And *nous* has control over all things that have soul, both the larger and the smaller” (καὶ ὅσα γε ψυχὴν ἔχει καὶ τὰ μείζω καὶ τὰ ἐλάσσω, πάντων νοῦς κρατεῖ). Since *nous* set in order all things that were, are, and will be, why does Anaxagoras feel that he has to tell us that it has control

over all things that have soul?<sup>14</sup> Clearly, the control *nous* has over things with soul is of a different kind than the control it has over everything else. In fact, it must be not only of a different kind, but also additional to the control it has over everything. But we are not told anything more on the nature of this control in the extant texts.<sup>15</sup>

In conclusion, the extant evidence indicates that Anaxagoras thinks that physical considerations are at play in the operations of *nous* in nature. Yet what is missing is a mechanism for such operations. It may be that the “mechanics” of thinking, deciding, or carrying out decisions was not something that Anaxagoras, or philosophers of his time (prior to Aristotle), conceived as a metaphysical problem to address. Yet, interestingly, it seems to be the case that for Anaxagoras there are *changes* taking place in *nous*. For instance, when *nous* “began to move” things, and “moved” things (B13); when *nous* started the vortex (B12); or when *nous* “set [things] in order” (B12); and *nous* “has control” over animate things (B12).<sup>16</sup> What is it that happens when these changes occur in *nous*? In view of Anaxagoras’s general stance regarding change, we would not expect any change in *nous* to be qualitative, but only perhaps a change involving movement. Such movement could not have been caused by anything other than *nous* itself in his ontology, since Anaxagoras describes *nous* as “self-ruling” (B12). We can therefore conclude that the mechanism of

14. That *nous* controls everything is implicit in Anaxagoras’s statement in B12 that “if it [sc. *nous*] were not by itself . . . it would control none of the things that in the way in fact does”; the way it does it, is specified a few lines later: “And whatever sorts of things were going to be, and whatever sorts were and now are not, and as many as are now and whatever sorts will be, all these *Nous* set in order.”

15. In sum, Anaxagoras distinguishes three ways of being in a thing, and tells us that *nous* is in things in two of these ways. It is present in things with a soul, having direct control over them; it is present in all things; and it does not itself have anything in it, in the sense of being mixed with any thing.

16. Aristotle writes that “Anaxagoras alone says that mind does not suffer change, and has nothing in common with any of the other things” (*De Anima*, 405b19). I take this to mean that Anaxagoras’s *nous* does not change in its nature, rather than that there are no moments of activation and action where its state is different from that of other moments.

operation of Anaxagoras's *nous* would need to be movement within *nous*, and that the key movement would be self-initiated movement. We do not have an explanation of how the latter is achieved, but the self-motion of *nous* seems to be one of the most anthropomorphic features in Anaxagoras's ontology. We will examine more of them in the next section.

### 5.3. *NOUS'S COSMIC POWERS*

In section 5.1 I reconstructed from the extant texts the reason why Anaxagoras might have held that a precondition for *nous's* being powerful is that its nature is the most rarefied and pure. In this and the following sections I will turn to examining what *nous* has the power to do, looking first at its cosmic powers and then at its cognitive powers. As I examine *nous's* cosmic power, I will investigate its nature, the conditions for its exercise, how it gets exercised, and whether Anaxagoras's system has built into it any kind of teleology or not. *Nous* is the generator of spatial movement in the universe, as Simplicius, for instance, reports Anaxagoras claiming in B13: "*Nous* is the cause of motion" (τῆς δὲ κινήσεως αἴτιον εἶναι τὸν νοῦν). This generic causal statement can be clarified and qualified in the light of a pattern that emerges from Anaxagoras's extant texts. When he explains the role and impact of the cosmic vortex *nous* generates in nature, he uses the verb ποεῖν (make, cause) to refer to its operation. Thus he says: "The revolution caused [ἐποίησεν] them [sc. things] to separate off" (B12); and "the revolution made [ἐποίησεν] them [sc. things] dissociate much more" (B13). Additionally, Anaxagoras talks in other places of the role and impact of *nous* in nature in terms of κρατεῖν (control). He writes, "*Nous* has control [νοῦς κρατεῖ] over all things" and "*Nous* controlled [νοῦς ἐκράτησεν] the whole revolution" (B12).<sup>17</sup> Notable also is Anaxagoras's use of the verb διακοσμεῖν in

17. I acknowledge that at one point in B13 Anaxagoras uses a more evidently physical verb, and says "whatever *Nous* moved (ἐκίνησεν)," where movement is to be

B12: “All these [sc. things] *Nous* set in order.”<sup>18</sup> These textual observations suggest that Anaxagoras conceived of *nous*’s causal action on the universe in anthropomorphic terms—doing, or making things happen, ruling over them, as a human being would, and not as (or, not only as) a purely physical cause would. Purely physical causes give shape, not order. Anaxagoras writes that

whatever sorts of things were going to be, and whatever sorts were and now are not, and as many as are now and whatever sorts will be, all these *Nous* set in order. And *Nous* also ordered this revolution, in which the things being separated off now revolve, the stars and the sun and the moon and the air and the aether. This revolution caused them to separate off.

ὅποια ἔμελλεν ἔσεσθαι καὶ ὅποια ἦν ἄσσα νῦν μὴ ἔστι, καὶ ὅσα νῦν ἔστι καὶ ὅποια ἔσται, πάντα διεκόσμησε νοῦς, καὶ τὴν περιχώρησιν ταύτην, ἣν νῦν περιχωρεῖ τά τε ἄστρα καὶ ὁ ἥλιος καὶ ἡ σελήνη καὶ ὁ ἀήρ καὶ ὁ αἰθήρ οἱ ἀποκρινόμενοι. ἡ δὲ περιχώρησις αὕτη ἐποίησεν ἀποκρίνεσθαι.

It is clear from this quotation that *nous* is for Anaxagoras an organizational, rather than merely interactive physical power in nature like the opposites are. This organization by *nous* has resulted in what took place in the past, what is taking place now, and what will take place in the future, as we see in B12. All this suggests *intelligent design*.<sup>19</sup>

understood as the effect of the *nous*’s control over things. But this is one occurrence only in all the extant texts.

18. διακόσμησις indicates the orderly (and beautiful) arrangement of the universe, especially in the Pythagorean system. See also Hussey (1972: 18) on the use of the term κόσμος in early Greek philosophy.

19. Even if there are cases attested—in the Hippocratic corpus, for instance—where the verb κρατεῖν is used to refer to merely physical operations, e.g., to refer to how an organism assimilates food, there is an overwhelming frequency of uses of it to refer to human action. Against my considerations, one might want to stress that the adjectives such as “finest,” “pure,” and “unmixed,” with which Anaxagoras characterizes *nous*, refer to physical properties and thus suggest that *nous* is a physical entity



What then is the nature of *nous*'s control on the universe at the cosmic level? In setting this world order, *nous* is responsible for the creation of its furniture out of the opposites and seeds, and out of their operation.<sup>20</sup> The question that needs addressing is whether *nous*'s organizational role has a teleological nature or not. Anaxagoras's description of the workings of *nous* in B12 indicates at least intentionality on the part of *nous*—there seems to be a plan that is gradually unfolding in the history of the world. Arguing in the same direction, Sedley calls attention to B4ab, remarking,

So far one might nevertheless retain the suspicion that this emergence of life is, as such, a mere accident of the cosmic arrangement, not necessarily an integral part of the intelligence's plans. This suspicion will not however survive the following consideration. . . . There seems absolutely no reason why accident alone should have ensured that each world [of the ones Anaxagoras mentions] had precisely one [sun and one moon]. (2007: 21–22)

In the opposite direction, however, Plato's complaints—voiced by Socrates in the *Phaedo* (97b–98c) and then echoed by Aristotle (*Met.* A 4, 985a18–21)—question the nature of *nous*'s cosmic plan. Is *nous*'s plan for the sake of the good? If so, what type of entity is the good in Anaxagoras's ontology, and how does it relate to the universe? There are textual indications that Anaxagoras thought that

and acts causally as such. This reading however would require imposing an impoverished interpretation on Anaxagoras's claim that *nous* sets order in the universe.

20. *Nous* does not create seeds and opposites out of nothing—they are already there in the primordial mixture; but by setting them in motion via the vortex, *nous* does cause local preponderance of the opposites and thus “create” stuffs and individuals. By placing emphasis on the anthropomorphic ways of operation *nous* has, I simply want to stress that it is an *intelligent* causal power, as I will argue in this section of the present chapter. On this point too I find myself in agreement with Sedley, who writes that “when intelligence decided to set up a cosmic rotation, the vortex began to separate the pairs of opposites, so that some regions had more hot than cold and vice versa. . . . It is from this *intelligently generated* set of imbalances that familiar stuffs like earth and water have been formed” (2007: 9, my emphasis).

*nous*'s cosmic plan was for the sake of an end that had value, since he tells us in B12 that the generation of the universe resulted from the *order* that *nous* sets the world in, through the motion it initiated.<sup>21</sup> On the other hand, Anaxagoras does not posit any entity of the kind of Plato's Form of the Good in his ontology. One can only speculate about the reasons why. In general, positing an entity such as "the good" as a fundamental building block in the universe is far from being an unproblematic move to make in developing a metaphysical system. By contrast, the thought that a system may be *well designed* is a metaphysically simpler and more economical option. I see Anaxagoras as assuming that the world's structure is good, given to it by its architect, *nous*, through the cosmic vortex it generates. On my reading, when Anaxagoras says that *nous* set in order the vortex and the things resulting from it, he is explaining exactly where, when, and how the good enters the design of the world. The goodness of Anaxagoras's world does not lie beyond the world, but is in the design of the world's structure.<sup>22</sup> In this sense, his cosmology is *teleological*. What does remain unaccounted for, in Anaxagoras's system, is the goodness of the building blocks in the universe, which include not only the opposites, but also the seeds or powers for life (as we will see in the second part of the present chapter). I believe this must be the reason for the complaint Plato registers against Anaxagoras's teleology, which stays at the level of the ordered arrangement, rather than the design of *all* there is in the world.

21. According to Sedley *nous*'s goal is ultimately to "reside" in human beings, and this is the good for the sake of which things in Anaxagoras's world are arranged the way they are by *nous*. He writes: "It therefore seems ultimately implicit in Anaxagoras's text that *nous* constructs and, as it were, fashions worlds primarily in order to generate human beings. The teleology proves to have an anthropomorphic bias. Since he further regards humans as, among all living creatures, the best vehicles for *nous* itself to occupy, it is at least a possibility that he thinks of the world as created by *nous* out of motives of pure self-interest" (2007: 24).

22. By contrast, Plato sets the Form of the Good as the "reigning" power in his ontology, superior to any other (see, e.g., *Republic* 509b). On the other hand, Plato does not describe the mechanism by which the good imparts its goodness to the world, but only the resulting participation of the things in the world in Form of the Good.

Anaxagoras's explanation of why Socrates stays in prison rather than escape (namely, because his body is physically arranged thus and so in that location) makes implicit reference to one type of control that *nous* has over the world—that is, to move what there is through the vortex. So in this sense it makes reference to a cosmic design that caused the vortex to get started. Socrates finds this explanation inadequate, because what he was expecting to hear from Anaxagoras was that the reason why he is in prison is that he thought this was the good thing to do (with respect to his relation to the Athenian polis). This explanation wears its teleology on its sleeve—it does not have to be assumed. Similarly, the ontological dependence of the Platonic Forms on the Form of the Good wears its teleology on its sleeve too. By contrast, the vortex moves things, but is the movement directed. And if so, how? It does not seem to wear its teleology on its sleeve.

An interesting question is this: *could* Anaxagoras give a satisfactory answer to Socrates with the resources of his philosophical system? I argued above, in section 5.2, that *nous* has a second type of control on things in the world, in addition to the one exercised through the vortex, as indicated by the fact that *nous* is in some things in a different way from the way it is everywhere. This second type is the *direct* control that *nous* has on the portions of *nous* in animate beings in the world. This type of control of *nous* to *nous* could explain for us the type of connection Socrates's decision to stay in prison has with the good. We do not have enough textual evidence to fully develop this possible line of answer and establish whether Anaxagoras would have and could have given it. Many of the details are missing: for instance, does goodness in one's decisions derive directly from the control of the cosmic *nous* on one's own *nous*? Or does goodness derive from one's own *nous*, namely, one's own capacity to plan one's life in good order? If so, how? While we do not have answers to these questions, we can see that Anaxagoras has the resources in his ontology to have developed the sort of answers Socrates was seeking. In conclusion, I submit the good *is* part of Anaxagoras's ontology through the presence and operation of the

*nous*, but its *modus operandi* is less explicit than in subsequent teleological systems, such as, e.g., Plato's or Aristotle's. The presence of *nous* is a clear enough instance of the presence of the good in the cosmos, but its ontological dissemination into the cosmos is not clear in extant fragments. On account of its limited scope, Plato and Aristotle, I submit, find it unsatisfactory.

#### 5.4. *NOUS'S* COGNITIVE POWERS

In addition to its cosmic "creative" and controlling powers, Anaxagoras's *nous* has also cognitive powers. *Nous* knows everything in Anaxagoras's world, as we read in B12:

It maintains all discernment about everything and has the greatest strength. . . . And *Nous* knew them all: the things that are being mixed together, the things that are being separated off, and the things that are being dissociated.

καὶ γνώμην γε περὶ παντὸς πᾶσαν ἴσχει καὶ ἰσχύει μέγιστον . . . καὶ τὰ συμμισγόμενά τε καὶ ἀποκρινόμενα καὶ διακρινόμενα πάντα ἔγνω νοῦς.

The first question arising for us is: how does *nous* attain such universal knowledge? Anaxagoras addresses this question, but only indirectly.<sup>23</sup> To understand his position, we need to first appreciate that for Anaxagoras the cognitive activity of *nous* is related to its controlling activity. In B12 Anaxagoras describes the controlling activity of *nous*, explaining that it should be unmixed to be able to control all the things that it can and it does control, as we saw in section 5.1 of

23. I disagree with Laks's suggestion that "the process of separation, which brings about the cosmos, may also be seen as the means by which νοῦς undertakes to make things as similar as possible to itself, namely [self] identical. For, in distinguishing things by means of the rotation νοῦς undertakes to identify them properly" (1993: 31). See also Leshner's critique (1994: 128–29) of Laks's suggestion.

this chapter. He then continues by offering an explanation of this claim, saying:

For it is the finest of all things and the purest, and indeed it maintains all discernment about everything and has the greatest strength.

ἔστι γὰρ λεπτότατόν τε πάντων χρημάτων καὶ καθαρώτατον καὶ γνῶμην γε περὶ παντὸς πᾶσαν ἴσχει καὶ ἰσχύει μέγιστον.

This is a list of the conditions that enable *nous* to have control over everything. It is fine and pure, so its nature is opposite to all that is to be controlled; it has judgment about everything, which is based on its knowledge of everything;<sup>24</sup> and ultimately *nous* has the greatest power in the cosmos. While these are conditions that we might in some way expect *nous* to satisfy, more surprising is what Anaxagoras says in B14: “*Nous*, which always is, most assuredly is even now where all the other things also are” (ὁ δὲ νοῦς, ὃς ἀεὶ ἐστὶ, τὸ κάρτα καὶ νῦν ἐστὶν ἵνα καὶ τὰ ἄλλα πάντα). Why is *nous* where the other things are? I submit that it is because control, and the presupposed knowledge of everything, requires *contact* with everything. This is a physical condition that *nous* has to meet: it must be where the other things are, spatially. The reason why it must be there, we are to understand, is not the specific location things occupy, but the fact that *they are there*.

To briefly recapitulate the results achieved in the first part of this chapter: I argued that *nous* is an intelligent power at work at the cosmic level in the universe. Its being unmixed allows *nous* to know everything and thus control everything. In positing *nous*’s intelligent control over the world, Anaxagoras pioneers a teleological approach that will be critiqued but also in essence endorsed and developed much further by Plato and Aristotle. In the next section I introduce another type of intelligent power that Anaxagoras posits in his

24. Control of everything requires knowledge of everything’s nature, to enable *nous* to “manage” each thing. On this issue, see Curd (2010: 199 ff.).

ontology: the seeds, which I call life powers. They are powers for the structural development of living beings.

## 5.5. THE SEEDS AND THE ORIGINS OF LIFE

Anaxagoras's philosophical investigation is driven, as we saw in the preceding chapters, by the challenge of accounting for the observable natural phenomena while respecting Parmenides's principles. The "creation" of stuffs such as earth or flesh is explained by means of local movement of preexisting tropes, the opposites. The opposites cluster in some region of space, in particular *ratios* to one another, making up (by predominance) bundles of stuff, like earth or flesh. Stuffs contribute to the constitution of material objects. Yet living beings are (symmetrically and/or asymmetrically) *structured* individual entities. (For instance, the face of a human being is symmetric along the vertical axis and asymmetric along the horizontal one.) Also, they develop along repeatable patterns in nature; for instance, man begets man. Furthermore, organisms may undergo developmental stages involving diachronic asymmetries; for instance, the growth of a beard in pubescent boys is a developmental structural feature that characterizes the male human population.<sup>25</sup> Intuitively, all these structural characteristics are irreducible to ratios of opposites only. Anaxagoras is aware that he needs to explain the presence in nature of living beings qua structured individual entities. He could not allow for them to be created as such, as this would contravene the Parmenidean strictures Anaxagoras adheres to. He therefore has to allow the preexistence of structures in the world, so as to facilitate the coming about of individuals, without their being created *ex nihilo*. With this in mind, Anaxagoras introduces seeds in to his

25. That it arises at puberty defines the developmental structure of male humans. (It is not the process of the growth of facial hair that is the structural feature.)

ontology, in addition to the opposites and *nous*. The seeds are not created, but have eternally been in the world, as Anaxagoras says in B4b:

Before there was separation off, because all things were together, there was not even any colour evident; for the mixture of all things prevented it, of the wet and the dry and of the hot and the cold and of the bright and the dark, and there was much earth present and seeds unlimited in number, in no way similar to one another.

πρὶν δὲ ἀποκριθῆναι [ταῦτα] πάντων ὁμοῦ ἐόντων οὐδὲ χροιοῦ ἔνδηλος ἦν οὐδεμία· ἀπεκώλυε γὰρ ἡ σύμμιξις πάντων χρημάτων, τοῦ τε διεροῦ καὶ τοῦ ξηροῦ καὶ τοῦ θερμοῦ καὶ τοῦ ψυχροῦ καὶ τοῦ λαμπροῦ καὶ τοῦ ζοφεροῦ, καὶ γῆς πολλῆς ἐνεούσης καὶ σπερμάτων ἀπείρων πλῆθος οὐδὲν ὁμοίων ἀλλήλοις.

Anaxagoras is concerned with the explanation of the origin and presence of structures of individuals in nature. He needs to explain how such structures come about, and do so in accordance to his metaphysical principles. It is clear from the texts that Anaxagoras traces the differences of one individual from another back to what is present in the seeds the individuals have “come from.”<sup>26</sup> If seeds contain the required structures, then mere growth would suffice to explain the coming to be of structured individuals.<sup>27</sup> We understand then what metaphysical work seeds are posited to do. But what is their nature? How do they do their metaphysical work? There is a naturalistic model available to Anaxagoras to solve the metaphysical questions seeds are posited to answer: it is the biological one, where organisms come from seeds.

26. If the seeds are the source of structure, what gives structure to them? There are two hypotheses; that *nous* has given them structure, or that it is an irreducibly primitive fact about the universe that the seeds contained in it are structured. Sedley (2007: 19) briefly discusses these two possibilities and opts for the primitive fact, as I do too.

27. It is also by and large accepted in the literature that individuals grow out of the seeds by addition of stuffs (and ultimately, opposites) to the seeds themselves.

I submit that Anaxagoras endorses this model and posits ordinary biological seeds as part of this ontology. On this issue, I align myself with many other scholars, including, for instance, Furley (1976: 72); Schofield (1980: 124); Curd (2002: 153); Sedley (2007: 15); and others. In particular, I share a widespread way of thinking (see, e.g., Schofield 1980 and Sedley 2007) concerning the seeds: if (counterfactually) they were anything other than ordinary biological seeds, this would imply that Anaxagoras introduced terms with a “technical” philosophical sense in his writings. But this according to Sedley is not the case. Anaxagoras’s way to proceed is, in Sedley’s words,

by outlawing ordinary-language usages which he considers misleading ... [Anaxagoras’s] key contribution to the Greek philosophical vocabulary lies in a cleaning up of philosophical language by studious *exclusion*. The further move of creating new terms, or redeploying existing words in unfamiliar technical senses, came only later. If “seeds” were being used by Anaxagoras as an innovative technical term, it would be a probably unique exception to the pattern I have described. (2007: 15)<sup>28</sup>

I see my own interpretation of the seeds supported by two sets of considerations: one concerns the issue of (the absence of a) technical philosophical vocabulary in Anaxagoras; the other concerns the difficulties that alternative interpretations encounter. It is on account of both that I find taking the seeds as biological ones to be the preferable reading.

The existing alternative interpretations are reviewed and discussed, among others, by Schofield (1980: 121ff); Teodorsson (1982:

28. On this point Sedley clearly disagrees with Vlastos, who claims that “when Anaxagoras through the concept of the *seed* generalizes this principle of germination from biology to cosmology, extending it to any process of generation whatsoever, he is seeking to convey a new idea for which none of the traditional terms offered a fitting vehicle” (1950: 36). According to Vlastos, “No one before Anaxagoras had ever used ‘seeds’ as he did ... [he] meant to stretch the word so far beyond its ordinary sense, applying it to inorganic as well as organic, matter” (1950: 33).



45 ff.);<sup>29</sup> and more recently Curd (2010: 171 ff.). I here limit myself to a brief mention of two positions that are at the two opposite extremes of the interpretative spectrum, in order to give the reader a sense of how widely these views differ. On the one hand, there are those who reify the seeds as an additional entity of a special kind: in Eric Lewis's words, "Seeds are, for Anaxagoras, mini *homunculi* of every individual organism that ever will be" (2000: 1).<sup>30</sup> Lewis reads B4 as saying there are in the original cosmic mixture "seeds of all the individual organisms that will ever exist. More specifically, these seeds are *homunculi* of all individual organisms, and therefore unique" (2000: 18). "The seed of me is a tiny version of me" (2000: 18). On this interpretation, the homunculi are taken to be primitively present in the cosmic mixture, and in appropriate circumstances some of them grow into individuals.<sup>31</sup> The difficulty with this interpretation is that on the one hand it includes in the ontology more than is needed, and on the other, such an addition does too much. What is needed for individuals to develop are not homunculi, but just structures, since the rest can come from the opposites in the mixture of its immediate environment, when the seed is in the appropriate conditions to grow. By saying that if the seeds were homunculi they would do "too much", I mean that if they are tiny versions of ourselves, then we exist long before we are born, having

29. Teodorsson's own interpretation is in one respect close to mine and in others very different. The point of similarity is that we both take the seeds to be the "software," as it were, which can "program" the opposites to cluster in a certain structural way, diachronically as well. The point of disagreement is that Teodorsson sees "the seeds of all things" as "*prefigurations, or matrices, of individual perceptible things, inorganic as well as organic*, with one σπέρμα for each individual thing of the universe" (1982: 82). For me, by contrast, there are seeds of living beings only, and they perform their programming function just in the way that biological seeds do, being biological seeds. Although we can find as early as in Aristotle the notion of a biological set of instructions, e.g., in the heat motions of a sperm, I believe that there is no reason to attribute as clear a division of programming instructions from (proto) implementation of these instructions in skeletal form to Anaxagoras. See also the discussion of Teodorsson's interpretation in Mourelatos (1986: 156–57).

30. The same view was held, for instance, among others by Mann (1980: 236).

31. This line of interpretation has been criticized, for instance, in Curd (2010: 174) and Palmer (2009: 239 ff.).

tiny bodies and instances of *nous*. I find no compelling reason to attribute this position to Anaxagoras. At the other extreme of the interpretive spectrum, there is the “deflationary” view that Brad Inwood, for instance, takes. He writes that “to say that the seed of *x* is in it [i.e., the mixture] is to say that there is enough of each of the needed opposites in it to produce *x*” (1986: 26). Inwood calls the way the seeds are in the mixture “virtual presence” (1986: 25). In addition to the difficulty of understanding what virtual presence is supposed to be in a world such as Anaxagoras’s where all there is has always existed and will always exist as it is, there is also a deeper problem with Inwood’s proposed interpretation. On his reading there is nothing that seeds contribute to the ontology in terms of structure. Thus, the crucial question that remains unaddressed is where structure come from, according to Inwood, in Anaxagoras’s system. To conclude this discussion, to my mind, seeds are a significant addition to the ontology by Anaxagoras. Following the biological model, seeds embody the possibility of producing an organism, *if* there is enough of each of the needed opposites in the environment. The seeds do not supply all that is needed for the production of an organism, but they provide the frame for the construction of the organism, and the mechanism by which materials from the environment can be collected to build the organism.

Moving forward now in reconstructing Anaxagoras’s account of living beings, it ought to be noted that he associates soul with the individuals that are generated from the seeds. We read in B4a:

Since these things are so, it is right to think that there are many different things present in everything that is combined, and seeds of all things having all sorts of forms, colours, and flavours, and that humans and also the other animals were compounded, as many as have soul.

τούτων δὲ οὕτως ἐχόντων χρὴ δοκεῖν ἐνεῖναι πολλὰ τε καὶ παντοῖα ἐν πᾶσι τοῖς συγκρινομένοις καὶ σπέρματα πάντων χρημάτων καὶ ιδέας παντοίας ἔχοντα καὶ χροιάς καὶ ἡδονάς. καὶ ἀνθρώπους τε συμπαγεῖναι καὶ τὰ ἄλλα ζῶα ὅσα ψυχὴν ἔχει.

Anaxagoras does not explain in the extant fragments what soul is, or how soul compares, metaphysically, to *nous*; he only points at a relation of (direct) control. We saw above that in B11 Anaxagoras says that “there are some things in which *Nous*, too, is present.” Interpreters of Anaxagoras combine this statement with the one in B12 that “*nous* has control over all things that have soul, both the larger and the smaller,” and attribute to Anaxagoras the claim that the soul in each animate thing is the *nous* that resides in it. Thus, for instance, Curd (2010: 61), who takes Aristotle’s complaint below as supporting the sameness of *nous* and soul in Anaxagoras:

Anaxagoras, as we said above, seems to distinguish between soul and thought, but in practice he treats them as a single substance, except that it is thought that he specially posits as the principle of all things; at any rate what he says is that thought alone of all that is is simple unmixed, and pure. (*De Anima*, 405a13–17)<sup>32</sup>

Ἀναξαγόρας δ' ἔοικε μὲν ἕτερον λέγειν ψυχὴν τε καὶ νοῦν, ὥσπερ εἵπομεν καὶ πρότερον, χρῆται δ' ἀμφοῖν ὡς μιᾷ φύσει, πλὴν ἀρχὴν γε τὸν νοῦν τίθεται μάλιστα πάντων· μόνον γοῦν φησὶν αὐτὸν τῶν ὄντων ἀπλοῦν εἶναι καὶ ἀμιγῆ τε καὶ καθαρόν.

I take Aristotle’s complaint to point in the opposite direction than the one Curd envisages. As I read him, Aristotle is saying that Anaxagoras considers *nous* and soul as different, but fails to pay full justice to this distinction. In fact, Aristotle points out some features of *nous*, such as that it has cosmic control, and that it has a pure constitution, as possible distinguishing features between *nous* and soul. In my understanding of Anaxagoras’s system, *nous* singles out certain types of entity in the universe, precisely those that have soul. Having soul is the criterion that distinguishes organisms from other types of entity in the cosmos. According to Anaxagoras, “*Nous* has control over all things that have soul” (B12). As we saw, this is a special control *nous*

32. I here quote from Barnes’s translation (Barnes 1984).

has over these entities, different from the overall control it has over everything in its universe. The difference, in my understanding of Anaxagoras's ontology, is constitutional: these entities have soul as part of their constitution, while the rest of what there is does not.

So, to recapitulate, Anaxagoras thinks that some things have soul, that *nous* comes to be present in things with a soul, that the portions of *nous* in larger animate things are larger than the portions of *nous* in smaller animate things, and that all portions of *nous* have the same nature as cosmic *nous*. What things, then, have soul? Those things that have life, or are alive. And how is life explained in Anaxagoras's system? A living being is physically structured, its life phases are diachronically structured, and it generates offspring with the same structure as the parent's. Anaxagoras cannot explain life with an ontology of opposites and their ratios only, because those cannot deliver structure. He thus chooses to add seeds to his ontology, as the origin of life. Seeds are powers for the dynamic development (in the right conditions) of physically and diachronically structured entities—that is living beings.

## 5.6. CLOSING REMARKS

*Nous* is a power in Anaxagoras, indeed the strongest power there is (ισχύει μέγιστον, B12). It is a power to rule itself (B12), to know everything (B12), to generate the cosmic vortex (B12), to control all things and to control in a special way animate things (B12), and to reside in animate things (B11). Furthermore, it is an intelligent power, with its own teleology. On the other hand, *nous* is not the only power Anaxagoras posits in his system. We saw, in chapter 1, that the opposites are powers as well, with a *local* range of influence in their environment, by contrast with the *cosmic* range of influence of *nous*. There are also life powers in Anaxagoras's system: the seeds. Seeds have the power to develop in a structured way, but not to design and plan their own development; in this sense we can say that they are intelligent powers. Thus, at a cosmic level, *nous* is responsible for the

world's order and design, which it constructs, while at the level of the world's furniture, there exist primitively structured clusters of opposites, which develop by addition of more opposites when *nous* sets the world order.<sup>33</sup> We are now in the position to draw the following conclusions: just as *nous* is causally responsible for the cosmic changes in the world, while the opposites are causally responsible for local changes, so *nous* is responsible for the organizational macrostructure of the cosmos, while the life powers in the seeds are responsible for the organizational microstructures in the world, the organisms. Finally, I argued that for Anaxagoras, *nous* has a special type of control over beings with soul, different from the type of control that *nous* has over everything in the cosmos. *Nous* is found in large and small portions in animate beings in nature, and these portions are of the same nature as the cosmic *nous*. This explains why the type of control that *nous* has over beings with souls is different, over and above the type of control it has over them and all else in the universe. Cosmic *nous* can have direct rapport with portions of *nous* in things with souls—for instance, cosmic *nous* can ensure that animate beings can survive and flourish in the environments in which they find themselves in nature.<sup>34</sup>

We have now explicated in full Anaxagoras's core worldview; while it would be interesting to investigate specific domains where Anaxagoras puts his metaphysics to use (such as, for example,

33. If counterfactually *nous* had the power to control the structural development of seeds, this would defeat the purpose of positing that the seeds exist *ab aeterno*.

34. We know from B4a that individual human beings have powers of intelligence, e.g., to construct cities:

There are cities that have been constructed by humans and words made, just as . . . the earth grows many different things for them, the most valuable of which they gather together into their household and use.

καὶ τοῖς γε ἀνθρώποισιν εἶναι καὶ πόλεις συνημμένας καὶ ἔργα κατεσκευασμένα, ὥσπερ παρ' ἡμῖν . . . καὶ τὴν γῆν αὐτοῖσι φύειν πολλὰ τε καὶ παντοῖα, ὧν ἐκεῖνοι τὰ ὀνήσιστα συνενεγκάμενοι εἰς τὴν οἰκίαν χρώνται.

Clearly these powers of planning and realizing their designs comes from the portion of *nous* in humans, which is therefore able to have goals and plan their actions accordingly.

perception and knowledge, biology, geology, and astrology), I leave the exploration of these possible directions to a future work. Next, I want present and discuss a worldview that shares—surprisingly—much in common with Anaxagoras’s with respect to its most original tenets—this is that of the Stoics’. The Stoics too conceive of reality as gunky, and their motivation, articulation, and application of the theory is both of intrinsic interest, and of value to further our understanding of Anaxagoras’s originality. To the Stoics I now turn.

## Stoic Gunk

This chapter sets out to investigate the only other metaphysical system in antiquity that is underpinned by the same core assumption as Anaxagoras's—namely, that reality is atomless or gunky.<sup>1</sup> A connection between Anaxagoras and the Stoics has rarely been drawn in the scholarship. Much divides them: to begin with, the fact that their metaphysical systems were developed respectively before, and after, the work of Plato and Aristotle and the range of metaphysical principles they introduced. In taking the two systems together as the only instances in antiquity of a world built on gunk, I aim to bring out what is distinctive of each, with respect to motivation, articulation, and use of the theory. This will enable us to understand Anaxagoras in greater depth, which is the primary focus of this book, but also the Stoics, and indirectly our own posture with respect to gunk: we are *discovering* it in nature, while the ancients *posited* it from first principles.

The most distinctive Stoic stance is their *extreme physicalism*: for them, everything that exists is body. To be closer to their way of speaking, we can call their view *corporealism*. Their motivation for this stance, I submit, is the Eleatic Principle (expressed

1. As other interpreters have done, I will develop my arguments on the assumption that it is legitimate to speak of the Stoics as a whole, at least in relation to some core views that unify the school, such as the ones this chapter is about. A defense of this assumption is beyond the scope of this book and would constitute a detour from its main themes.

by Plato in the *Sophist*)<sup>2</sup> according to which only what is causally powerful exists. For the Stoics, only bodies can be causally powerful. Coming after Plato and Aristotle, the Stoics engage with their metaphysical “inheritance” by tailor-fitting it to their own physicalist assumptions, thereby generating many innovations in the history of metaphysics.<sup>3</sup> Such innovations concern the way Stoic corporealism accounts for the constitution of ordinary material objects, for their possession of properties,<sup>4</sup> and for causality. Of

2. *Sophist* 247e: “I am saying that a thing really is if it has any capacity at all. Either by nature to do something to something else or to have even the smallest thing done to it, by even the most trivial thing, even if it only happens once. I’ll take it as a definition that *those which are* amount to nothing other than *capacity*” (translation by N. P. White).

3. I take my approach to be aligned with Katja Vogt’s, in that we both argue that the Stoics have a distinctive take in their philosophical explanations of reality, very different from Plato’s and Aristotle’s, on account of their corporealism. Where Vogt and I differ, to my mind, is in how we see the Stoics put their corporealism to work. In this chapter I argue that the Stoics use *physical operations*, such as division and mixture of the basic elements in their ontology (which are bodies), to do *metaphysical work* in their system. Vogt on the other hand has argued that for the Stoics there is no separation between physics and metaphysics and that it is physics rather than metaphysics that delivers for them the most basic account of reality. In this, she identifies the Stoic philosophical distinctiveness. Vogt (2009) writes that,

Their focus on corporeals . . . explains why the Stoics do not have the kind of theory that, with respect to Plato and Aristotle, we call metaphysics. . . . Talk about “Stoic ontology” is clearly more directly rooted in the texts [than talk of “Stoic metaphysics”]. But even here, it seems important to keep in mind that we are not referring to a theory that is separate from particular investigations in physics, logic, and ethics, or that would offer a deeper understanding of reality than these disciplines do. . . . [T]he Stoics are Sons of the Earth in the metaphorical sense that they look at the earth and think that the most basic account that philosophy can offer is an account that explains the physical universe. (137, 145, 149)

Also arguing that the Stoics have a worked-out metaphysics (which she characterizes as sophisticated physicalism) is Vanessa de Harven (“Stoic Incorporeals: A Grounded Account,” unpublished manuscript), who concludes:

Thus there is good reason to extend Brunschwig’s suggestion that the Stoics were masters of their theoretical domain, leading with their ontology and going beyond physics to metaphysics.

4. Although the Stoics do not believe universals exist, they hold that ordinary material objects can each be classified under various concepts (which they reify, in line



special interest to us is the fact that such innovations all derive from the assumption that what exists (bodies), exists as *unlimitedly divided*. I will argue in this chapter that the unlimited division of bodies allows for their *colocation* in the same spatiotemporal region, and that colocation does crucial explanatory work in the Stoic account of some fundamental physical and metaphysical relations in their system.

## 6.1. UNLIMITED DIVISION

There is explicit textual evidence that the Stoics believe in unlimited division of body, for example in the following texts:

T1: Stobaeus 1.142, 2–6 (LS 50A)

Chrysippus said that bodies are divided to infinity, and likewise things comparable to bodies, such as surface, line, place, void and time.

Χρύσιππος ἔφασκε τὰ σώματα εἰς ἄπειρον τέμνεσθαι καὶ τὰ τοῖς σώμασι προσεικότα, οἷον ἐπιφάνειαν γραμμὴν τόπον κενὸν χρόνον.

T2: Sextus, *Against the Professors* 10.121–26, 139–42 (LS 50F)

Let us start our argument with the first school of thought, according to which all are divided to infinity. . . . [Such school of thought comprises] those who say that bodies, places and times are divided to infinity, namely the Stoics.

τάξει δὲ ἀπὸ τῆς πρώτης στάσεως ποιώμεθα τὴν ἐπιχείρησιν, καθ' ἣν πάντα εἰς ἄπειρον τέμνεται. . . . τοὺς εἰς ἄπειρον τέμνεσθαι λέγοντας τὰ τε σώματα καὶ τοὺς τόπους καὶ τοὺς χρόνους (οὗτοι δὲ εἰσιν οἱ ἀπὸ τῆς Στοᾶς) ταῦθ' ἥρμοξε λέγειν.

with their physicalism). This generates for them the explanatory need to account for why they fall under such concepts.

The language used in these texts is neutral as to whether the division of bodies under discussion is an infinite division into *points*, or an infinite division into *parts*. There is however additional textual evidence that shows that for the Stoics the division of body generates parts (μέρη, see T3 here below). What makes the metaphysical picture far from straightforward is that in the very same report where Stobaeus talks about infinite division (which is the text from which T1 is taken), he surprises us with a *prima facie* puzzling claim attributed to Chrysippus, concerning the parts resulting from the unlimited division of body:

T3: Plutarch, *On Common Conceptions* 1081C–82A (LS 50C)

With respect to the ultimate parts, it must be said neither of which parts we consist, nor, likewise, of how many, either infinite or finite. I believe I have quoted his [Chrysippus's] actual words. (Translation modified)<sup>5</sup>

τὰ ἔσχατα μέρη . . . ῥητέον οὐτ' ἐκ τινων συνεστάναι, καὶ ὁμοίως οὐτ' ἐξ ὀποσωνοῦν, οὐτ' ἐξ ἀπείρων οὐτ' ἐκ πεπερασμένων.' καὶ μοι δοκῶ ταῖς ἐκείνου κεχρησθαι λέξεσιν αὐταῖς.

We know that Chrysippus also holds that what a three-dimensional body is divided into are *not* infinitely many three-dimensional bodies; similarly, surfaces are not divided into infinitely many surfaces, or lines into infinitely many lines.

T4: Stobaeus 1.142, 2–6 (LS 50A)

But although these [bodies] are divided to infinity, a body does not consist of infinitely many bodies [resulting from the division], and the same applies to surface, line and place.

5. I prefer to translate the expression ἐκ τινων as “which parts,” and not as “what parts,” as L&S do. The English expression “what parts” is ambiguous, and could be understood either as “what sort of parts” or as “which parts.” But Chrysippus’s concern here, I argue, is the *lack of distinctness* of the parts resulting from unlimited division of body; this concern is more accurately captured by the translation I offer. I also note that the text from T3 is presented as a word-by-word report of Chrysippus’s views.

εἰς ἄπειρόν τε τούτων τεμνομένων οὔτε σῶμα ἐξ ἀπείρων σωμάτων  
συνέστηκεν οὐτ' ἐπιφάνεια οὔτε γραμμὴ οὔτε τόπος.

So what does Chrysippus think of the parts? Why does infinite division of a body not deliver infinitely many bodily parts? T3 tells us that, for Chrysippus, bodies have no ultimate parts, and that a body's ultimate components are neither infinitely many items, nor finitely many. T4 says that a body is not made up of infinitely many (bodily) parts. At the same time, nothing in the text indicates that Chrysippus thought that unlimited division destroys body, in such a way that there are no parts left. My interpretation of T3 and T4 taken together is that, for the Stoics, it is not the case that there are no parts, but rather that there is *no set of items that are the ultimate parts* of body, because there is *no end* to the division.<sup>6</sup> The division is unceasing, as reported, for instance, here:

T5: Diogenes Laertius 7.150–51 (LS 50B)

Division is to infinity, or “infinite” according to Chrysippus (for there is not some infinity which the division reaches; it is just unceasing).

ἢ τε τομὴ εἰς ἄπειρόν ἐστιν (ἦν ἄπειρον, <οὐκ εἰς ἄπειρόν> φησιν  
ὁ Χρύσιππος. οὐ γάρ ἐστὶ τι ἄπειρον, εἰς ὃ γίνεται ἡ τομή. ἀλλ'  
ἀκατάληκτός ἐστι).

I reconstruct Chrysippus's thought as follows: if we look for the ultimate parts, we are looking for the end of the division of the body. Let us suppose that at each step, we divide each part of the body into half. What do we get at the end of all divisions? Every step is a multiplication, by two, of the items in the previous step. So this way to proceed will never get us to infinity, since starting with finitely many parts and doubling them will always give us a finite number. This means that any row of division Chrysippus counted would have

6. The division has no *physical* end, rather than no temporal end.

finitely many items. This is true of all rows—ultimate, or not—and gives a compelling reason to say the parts are finitely many. But the rows toward the ultimate one are infinitely many, i.e., the “ultimate” row is at infinity. Hence, Chrysippus says, the ultimate parts are neither finite nor infinite. This means that there is a reason to call them finite, and there is reason to call them infinite. So, Chrysippus concludes, they are neither.

The textual evidence is clear that the Stoics held that the division of body is unlimited. What we need to explore now, as we did with Anaxagoras, is the metaphysical significance of this stance. If unlimited, the division does not stop at any kind of atoms. I derive this conclusion from the claim that the ultimate parts are neither infinite nor finite (T3) and that the division is unceasing (T5). Therefore the division does not stop either at extended atoms or at extension-less points.<sup>7</sup> So, what are the parts of unceasing division like? I submit that the unlimited division of a body (as the unlimited division of a trope in Anaxagoras’s case) generates parts whose size converges on zero extension. The constituent parts of unlimitedly divided bodies are infinite series of parts converging on zero extension or point-size, without ever reaching this limit. At the foundations of the Stoic system—as well as Anaxagoras’s—there is *divided* atomless gunk.<sup>8</sup>

While some modern metaphysicians, as we saw in chapter 3, have explored the *conceptual possibility* that the universe may be an atomless continuum, for Anaxagoras and the Stoics, actual or divided gunk is the “tool” they need to build their physical universe. More

7. We do talk of lines as being infinitely divided into points, but the Stoics would not allow bodies to consist of extensionless points, since points, as mathematical limits, are, according to the Stoics, neither corporeal nor incorporeal. Infinite division is always division into extended (and so divisible) parts. The same is true of division of lines and time etc. because these are incorporeals (namely, physical and dependent on bodies), while points are neither physical incorporeals nor corporeals.

8. In chapter 3 I argue that divided gunk does not raise special conceptual difficulties if one is willing to accept unlimited divisibility in the first place.

specifically, they need it to allow for colocation of the fundamental entities in their respective systems. Colocation is, I will argue, the *physical* relation the Stoics use to account for key *metaphysical* issues such as constitution and property possession, in ways that fit in with their corporealism. Colocation is also a precondition for causation for the Stoics, whom I take to endorse the general principle of no action at a distance. (For Anaxagoras, as we saw in chapter 3, colocation or compresence allows for constitution and property possession [via preponderance], and for change [via the action of a cosmic vortex] in a world that abides to Parmenidean laws.)

## 6.2. COLOCATION

Colocation is a Stoic thesis that has exercised the commentators since antiquity. Alexander of Aphrodisias reports:

T6: Alexander, *On Mixture* 216.14–217.12 (LS 48C)

Chrysippus has the following theory of blending: . . . when certain substances and their qualities are mutually co-extended through and through, with the original substances and their qualities being preserved in such a mixture; this kind of mixture he calls specifically “blending” . . . he believes that such a coextension of blended bodies occurs when they pass through one another, so that no part among them fails to participate in everything contained in such a blend.

ἔστι δὲ ἡ Χρυσίππου δόξα περὶ κράσεως ἥδε. . . δι’ ὅλων τινῶν οὐσιῶν τε καὶ τῶν τούτων ποιότητων ἀντιπαρεκτεινομένων ἀλλήλαις μετὰ τοῦ τὰς ἐξ ἀρχῆς οὐσίας τε καὶ ποιότητος σώζειν ἐν τῇ μίξει τῇ τοιαύτῃ, ἥντινα τῶν μίξεων κράσιν ἰδίως εἶναι λέγει. . . τὴν δὲ τοιαύτην ἀντιπαρέκτασιν τῶν κίρναμένων ὑπολαμβάνει γίνεσθαι χωρύντων δι’ ἀλλήλων τῶν κίρναμένων σωμάτων, ὥς μηδὲν μῶριον ἐν αὐτοῖς εἶναι μὴ μετέχον πάντων τῶν ἐν τῷ τοιοῦτῳ κεκραμένῳ μίγματι.

The substances in question are corporeal (*sōmata*); as we will see from other texts, they may be simple bodies (i.e., the basic elements in the Stoic system, *pneuma* and *hylē*) or composite bodies, such as, for instance, water and wine (which result ultimately from the combination of *pneuma* and *hylē*). The view the Stoics hold is that some substances can be thoroughly blended with each other, i.e., colocated in a given spatiotemporal region over which they coextend.<sup>9</sup> By this the Stoics mean that when colocated, such substances come to occupy the same region of space, as each would on its own. This claim is as counterintuitive to us as it might have been to the Stoics' contemporaries. One could uncharitably say that it is nonsensical. How is colocation of bodies such as water and wine possible, in such a way that there is some water wherever there is some wine? If any Stoic account was given, none has survived. I argue that the Stoics posited unlimited division of body to provide an account for the coextension of bodies that would not defy any laws of physics. Recall that gunk has parts converging to zero extension. This, I argue, allows the Stoics to explain blending in terms of the colocation of the parts of the blended substances, each of which *approaches zero extension* and thus can be located where another is located.<sup>10</sup>

It will be helpful to contrast my interpretation of Stoic blends to that of Daniel Nolan (2006), who was the first to approach the issue in terms of location of gunk in space. Nolan proposes that we think of coextension of bodies in terms of mixtures of (material) hunks of gunks, which can somehow be colocated. This is intended to account for the compresence of the elements of the mixture without

9. One may wonder: given that all things exist as divided, why do only some of them come to be colocated by blending? The Stoics do not address this question in the texts that have survived. The answer could be simply based on experience: we find out empirically what does and what does not blend. One can only conjecture whether the Stoics would have given this answer, or a metaphysical reason.

10. Even if there is no explicit textual evidence that the Stoics thought this way, in order to allow compresence of material objects such as water and wine they must be committed to giving up continuity of matter.

committing the Stoics to saying that two bodies are in the same place, i.e., compenetrating (which is assumed to be unsound by the Stoics). Nolan writes,

If each of the substances to be blended has no ultimate parts, the blend itself can contain all of these parts without there having to be any continuous region in the blend which is wholly occupied by part of only one of the blended substances. For there can be a division of the blend, such that no matter how many stages of division are carried out, all of the so-far divided proper parts of the blend contain proper parts of both of the blended substances. (This can be easily generalised for blends of more than one substance . . .). Furthermore . . . any continuous region of the blend is wholly occupied by a piece of the blend which has parts of the original blended substances among its own parts. (2006: 171–72)

The innovation here is distinction between “strict” and “loose” location, and the suggestion is that no one of the blended substances is strictly located in the blend.<sup>11</sup> Assuming that Q and Q’ are the mixants and O the blend, Nolan explains that

Q and Q’ will not be located anywhere at all (though we may still say that they are in a loose sense, since they will retain an important connection to the place where O is). If we do this, then we are not forced to say the mixed substances are in the same place—the mixture is in a specific location, true enough, but while they remain mixed the components are not in a place at all (at least in the strict sense). (2006: 174)

11. Josh Parsons (2007) offers an intuitive characterization of the difference (but note that he uses “weak” and “exact” location in place of strict and loose). Parsons explains exact location thus: “I am exactly located anywhere that I am both entirely and pervasively located”; and weak location thus: “Let us say that I am weakly located in my office iff I am in my office in the weakest possible sense: iff my office is not completely free of me” (2007: 203).

Thus Nolan's solution, on behalf of the Stoics, is that each of the blended substances is in the blend, and yet *it isn't* (because having a weak location supposedly amounts to not being located anywhere at all)—this is how the blended substances can be all compresent in without material compenetration.<sup>12</sup>

There is much discussion of the distinction between strict and loose location in the contemporary metaphysics literature, but of particular relevance here are Josh Parsons's (2007) arguments, which engage directly with Nolan's argument quoted above. Parsons raises two difficulties for Nolan's account of the Stoic blend. The first is that strict (*scilicet* exact) and loose (*scilicet* weak) location cannot be defined independently; the definition of the latter is dependent on the definition of the former: an object is "weakly located at every region overlapping its exact location" (2007: 208). Hence one cannot hold that the mixants are weakly located, but also not exactly located somewhere. Additionally, Parsons finds Nolan's distinction problematic in that what is weakly located in the blend is still there in a "pure" state, i.e. as, e.g., wine and water:

I have my doubts about whether this [i.e., the way Nolan models metaphysically the blend] is really distinct enough from the wheat and lentils case to be what the Stoics were after. After all, on Nolan's view, there are still parts of the blend that are pure

12. Would the distinction between strict and loose location be a way forward for Anaxagoras too, to explain how the opposites are compresent with each other? There are a number of considerations to be made here. First, there is an important disanalogy to register between the Stoic blend of bodies and Anaxagoras's extreme mixture of opposites. They are both mixtures, but in the Stoic one the hunks of gunk are assumed to causally interact with each other. (Nolan is silent on how on his account they can causally interact, which isn't easy to explain when the mixants are only potentially in the blend). By contrast, Anaxagoras's hunks of gunk do not (and cannot, for Parmenidean reasons) affect each other causally, and this facilitates their being colocated. Second, there is the philosophical rather than interpretative question of whether the distinction between loose and strict location appealed to by Nolan is a sound one, which we need to address before determining if one can borrow such distinction on behalf of Anaxagoras. My conclusion is negative; we can't borrow it, and we need not borrow it.



wine and pure water, rubbing shoulders in the blend just like grains of wheat and lentils. Unlike grains of wheat, they are not exactly located anywhere—but they are still parts of the blend, and they are still unmixed. (2007: 208)

In other words, Nolan holds that as long as the mixants are weakly located in the mixture, there is no obstacle as it were to their being thoroughly blended with each other. By contrast Parsons suggests that, even granting for the sake of argument that something can have weak but not exact colocation (which he deems impossible), the retained purity of water and wine in the blend is incompatible with their being thoroughly blended.<sup>13</sup> The Stoic fusion thus become on Nolan's account a "blurry" case, in between blend and juxtaposition.<sup>14</sup>

In conclusion, Nolan argues, as I do, that the Stoics believe in gunk, but he does not use what I take to be the most relevant feature of gunk (namely, the convergence of the parts to zero extension) to explain how the Stoics can account for colocation. Nolan offers for colocation an interpretation alternative to my own. He thinks the solution to the question of how blended substances can occupy the same spatiotemporal location lies in drawing a distinction between loose and exact or strict location. There are a number of difficulties with Nolan's interpretation. The three main issues are the following.

13. This is a point already made by Alexander of Aphrodisias, *On Mixture* 220.23–36 (Todd 1976: 127).

14. This discussion has been taken forward most recently by Matt Leonard, who casts the divergence between Nolan's and Parson's views in terms of different degrees of ontological parsimony one may want to have in one's theory of space. Leonard writes:

The theories formulated by Varzi and Parsons are ideologically parsimonious: they only posit *one primitive* location relation. I'll consider one possible way of reviving Nolan's claim about the case by introducing *multiple primitive* location relations [i.e., by taking both weak and exact location as primitive], but then show that this comes with a high cost: not only is this route ideologically costly, but we won't have enough constraint on our theory of location, unless we posit some brute metaphysical necessities [about location]. (2014: 307–8; my emphasis)

First, Nolan treats divided gunk as if the parts “lost” their location; i.e., as if by having only loose location, the components of the blend were not in a place at all. There is no evidence in the surviving texts that the Stoics took this view. Additionally, this is, philosophically, a view that would need more explication and defense, for it is a puzzling one: how can division of body “dislocate” its parts, i.e., deprive them of their location?<sup>15</sup> Second, and as already discussed in the modern philosophical literature, loose and strict locations are not definable independently from one another, contrary to what Nolan implicitly assumes. Finally, Nolan holds that as long as the mixants are loosely located in the mixture, there is no obstacle, as it were, to their being thoroughly blended with each other. But the “purity” of the mixants, which Nolan assumes, entails that they are still metaphorically “rubbing shoulders” in the blend, like wheat and lentils or pepper and salt. I conclude that Nolan does not offer a sound solution for how the Stoics could have accounted for colocation of bodies. The next question I want to address is: what does colocation explain in Stoic metaphysics? I will argue that it accounts for constitution of material bodies, property possession, and causation. I start with constitution.

### 6.3. THE CONSTITUTION OF MATERIAL BODIES: WHAT IS ACTIVE AND WHAT IS PASSIVE

The Stoics inherit from Aristotle a metaphysical analysis of material objects in terms of matter and form, or in short, what is known as his hylomorphism. They posit two cosmological principles (*archai*) out of which everything is made. These first principles are, in Stoic terminology, that which acts (*pneuma* or breath or god), and that which

15. Nolan’s account of nonlocated gunk better fits those who believe that actual division into gunk destroys matter—but Nolan does not commit himself either way on this issue.

is acted upon (*hylē* or matter).<sup>16</sup> Both are everlasting, ungenerated, and indestructible. *Hylē*, the passive principle, is entirely unqualified in itself, but is at all times inseparably connected to and qualified by (in the sense I will explain below) *pneuma*.<sup>17</sup> *Pneuma* also exists always as combined with *hylē*.<sup>18</sup> Together *pneuma* and *hylē* make up the four elements (fire, air, earth, and water)<sup>19</sup> and from them, ordinary material objects.<sup>20</sup> The two principles are thus described:

T8: Diogenes Laertius 7.134 (SVF 2.300, part 2.299) (LS 44B)

They [the Stoics] think that there are two principles of the universe, that which acts and that which is acted upon. That which is

16. Some scholars (e.g., Cooper 2009) have made the point that the two fundamental entities the Stoics posit in their system, *pneuma* and *apoios hylē*, are both first principles but only *pneuma* is a cause, because it is that which acts. This interpretation identifies being a cause with being a causal agent. I disagree with it and take both to be causally powerful, for reasons that I explain in the present chapter.

17. I will use in what follows the transliteration of the Greek terms without translating them, as I have done with Anaxagoras's *nous*.

18. I will not discuss here the phenomenon or ontology of conflagration, about which I remain skeptical, like other scholars, including, e.g., Vogt. I cannot enter here into a discussion of the relevant issues.

19. The division between *pneuma* and *hylē* is (in the doxography) to some degree contextual (just as the division of matter and form in Aristotle is to the same degree contextual). So, for instance,

T7: Galen, *Plen.* 7.525.9–14 (SVF 2.439) (LS 47F)

The breathy substance is what sustains, and the material substance what is sustained. And so they say that air and fire sustain, and earth and water are sustained.

τὴν μὲν γὰρ πνευματικὴν οὐσίαν τὸ συνέχον, τὴν δὲ ὑλικὴν τὸ συνεχόμενον, ὅθεν ἄερα μὲν καὶ πῦρ συνέχειν φασί, γῆν δὲ καὶ ὕδωρ συνέχεσθαι.

For present purposes I will use *pneuma* to refer, as it were collectively, to what the Stoics call in different contexts a reason, god, the active principle, sustaining power, breath, the mixture of fire and air; they are all *one type* of fundamental body. I will use *hylē* to refer to the propertyless substratum, the passive principle, water and earth, matter etc.; i.e., to the *other type* of fundamental body.

20. I take it that for the Stoics, qualitative difference and structure are primitives in their ontology. Both qualitative difference and structure are found primitively in god. That god is the active principle and matter is the passive one is also a primitive in the Stoic system.

acted upon is unqualified substance, i.e. matter;<sup>21</sup> that which acts is the reason in it, i.e. god. For this . . . constructs every single thing [composite] throughout all matter.<sup>22</sup>

Δοκεῖ δ' αὐτοῖς ἀρχὰς εἶναι τῶν ὅλων δύο, τὸ ποιοῦν καὶ τὸ πάσχον. τὸ μὲν οὖν πάσχον εἶναι τὴν ἅποιον οὐσίαν τὴν ὕλην, τὸ δὲ ποιοῦν τὸν ἐν αὐτῇ λόγον τὸν θεόν. τοῦτον γὰρ . . . διὰ πάσης αὐτῆς δημιουργεῖν ἕκαστα.

There are a number of issues to investigate in relation to this characterization of the two principles. Two are of particular interest to us here (and have not yet received due attention in the secondary literature). We know that for the Stoics both *pneuma* and *hylē* are bodies (*sōmata*), because they are causally active.<sup>23</sup> On the other hand, the way *pneuma* and *hylē* are characterized in T8 requires us to examine the question of what body is for the Stoics. *Pneuma* is corporeal (it is body, *sōma*); but has no matter (*hylē*) in its constitution. So in the Stoic conception, “body” cannot be what has matter. At the same time, *hylē* is propertyless (ἄποιος) and yet body (*sōma*), too. Hence being a body cannot depend on having any type of property. What does “body” mean for the Stoics, then? We know that body is three-dimensional (see, e.g., LS 45E) and causally powerful (see, e.g., LS 45A). I submit that the Stoics are operating on a conception of body that is pre-Aristotelian and pre-Platonic. On my understanding, “body” for the Stoics means *extended causal powerfulness*. (I argued in chapter 1 that Anaxagoras too thought of being physical in this way, as being a causal power extended in three dimensions.<sup>24</sup>

21. Their conception of propertyless matter is a successor concept to Plato's *chora* in the *Timaeus*, and Aristotle's ultimate substratum in *Metaphysics* VII.3.

22. Propertyless matter is not space or generally the individuating principle of substances, according to the Stoics. Particulars are individuated by their respective individual forms, and are, in Stoic terminology, *peculiarly qualified* (see, e.g., LS 28I).

23. They are each body in a special sense of being somehow interdependent and thus each one incomplete without the other.

24. It is intuitive to think of such properties as heat or generally the opposites as extended causal powers; but it is less intuitive to think of a propertyless something

The difference is that Anaxagoras divided the causally powerful into kinds of powerfulness—the infinitely many opposites—while the [post-Aristotelian] Stoics divided the causally powerful into the genera of the active and the passive—*pneuma* and *hylē*.)

A second issue of special interest for the present argument is the question of why the Stoics posited *hylē* in their system. Could the Stoics have done without it? It seems *prima facie* that *pneuma* has/is everything the Stoics need to build the universe. My thought is that the Stoics *could* have done without *hylē*, save for their theological assumptions. On my interpretation of the Stoic metaphysical system, their main motivation for positing matter (*hylē*) as the passive principle in the constitution of the universe is what we could call “division of causal labor.” For the Stoics, *pneuma* is not only what is qualified and gives qualities to everything there is (thereby playing an metaphysical role equivalent to Aristotle’s forms), it is also divine. In the same way that Aristotle wanted god to be pure actuality with no matter, I submit, the Stoics want god to be purely active. Assuming that, to account for change, there needs to be in a system something that is active and something that is passive, if in the Stoic system there were no matter for god to act on, god itself would have needed to play both an active and a passive role. But it is not apt for the divine to be passive. So *hylē*, I submit, is posited to serve as the passive principle in the Stoic account of the constitution and changes of material objects.<sup>25</sup> I take *hylē* to be for the Stoics the ultimate principle of passivity, in itself ἄποιος. I conjecture that passivity and propertylessness are conceptually connected, and that the Stoics must have thought along these lines: property, form, structure

(i.e., *hylē*) as an extended causal power. Nevertheless, Plato did think this about the receptacle (in the *Timaeus*, which influenced the Stoics); the receptacle can be thought of as causally powerful empty space. The relevant arguments cannot be developed in this context.

25. There is some doxographic evidence (e.g., Calcidius 293, LS 44C) that suggests that the Stoics might have thought that matter is needed in their system, for the same reasons as Aristotle’s, to address Parmenidean concerns. To my mind this evidence misrepresents the Stoics’ view.

(i.e., god) are ways of being active; they shape, form, qualify propertyless being; hence, they have an active constitutional-causal role in being. So the ultimate principle of passivity cannot be qualified.<sup>26</sup> There is an interesting comparison of causal roles between Anaxagoras's opposites and the Stoic one. As we will see, the Stoic conception of causation is fundamentally via compresence, namely, constitutionally. Both accounts are causal constitutionally, by compresence—of opposites in the one case, and of *pneuma/hylē* in the other, or of oppositely qualified objects (e.g., hot and cold ones).<sup>27</sup> Their understanding of causation is to be contrasted to the Aristotelian conception of a causally interacting passive power suffering change.

We know that for the Stoics all *pneuma* is colocated or blended with *hylē* throughout nature, and interacts with it.<sup>28</sup> For example we read:

T9: Alexander, *On Mixture* 216–17 (LS 48C1, 4)

Chrysippus has the following theory of blending: he first assumes that the whole of substance is unified by a breath which pervades it all, and by which the universe is sustained and stabilized and made interactive with itself.

ἔστι δὲ ἡ Χρυσίππου δόξα περὶ κράσεως ἥδε. ἡνώσθαι μὲν ὑποτίθεται τὴν σύμπασαν οὐσίαν, πνεύματός τινος διὰ πάσης αὐτῆς διήκοντος, ὃφ' οὗ συνέχεται τε καὶ συμμένει καὶ σύμπαθές ἐστιν αὐτῷ τὸ πᾶν.

The question for us to address is this: how do *hylē* and the *pneuma* interact with each other, and make up things, according to the Stoics?

26. See the following section of the chapter for an account of the constitutive causal role *pneuma* has on *hylē*.

27. Both Anaxagoras and the Stoics also allow for causing movement, which is not constitutional.

28. This is an important point of difference with Anaxagoras's mixtures, where the elements do not interact with each other.

Their interaction cannot be efficient causation of the Aristotelian kind (which presupposes causal powers in both agent and patient; see, e.g., *Physics* III 3), because the propertyless matter has no powers or dispositions for causal interaction.<sup>29</sup> Additionally, from T9 we learn that the relation of *hylē* and *pneuma* is presupposed for the universe to become causally interactive. So their relation could not be an instance of the same type of interaction as the one they are posited to explain, on pain of regress. To make progress in understanding the Stoics' views regarding the interaction between *hylē* and the *pneuma*, we need to investigate further what the difference between active and passive bodies is supposed to be for the Stoics. I will argue that the active-passive distinction, despite its Aristotelian "pedigree," is very different from how Aristotle understands it. Consider, for instance, the blend of a pair of composite bodies (each of them made of *pneuma* and *hylē*) like water and wine. When blended, neither is passive or active on the other, notwithstanding the fact that they are causally interactive. In their interaction, neither operates on the other, bringing about changes *in* the other (by contrast to, e.g., Aristotle's conception of causal powers). Causal interaction for the Stoics doesn't require that the active "compromise" the passive.<sup>30</sup> Rather, I understand the terms active and passive as used by the Stoics as expressing an *ontological asymmetry* between *pneuma-hylē*. Their asymmetry must be grounded in the Stoic view that *pneuma* comprises qualities, while *hylē* is qualityless. Furthermore, recall that, according to Stoics, *hylē* and *pneuma* can never separate. Although *hylē* and *pneuma* are physically blended the way that ordinary material objects are, e.g., wine and water, *hylē* and *pneuma* can never be found separately, while ordinary material objects can be separated even after having been

29. The notion of *hylē* as bare potentiality is Aristotle's, but such an entity, if there is one, is not capable of efficient causal interaction. Even if the Stoics made it a body, they still think of it as *dependent* on *pneuma*—e.g., it is not separate and discrete in virtue of itself; it is always found in composition with *pneuma*. So its status of being a body does not ipso facto endow it with causal efficacy *qua* body.

30. The *apoiōs hylē* can be passive only in a *receptive* sense (à la Plato's receptacle), rather than by *suffering* compromise (à la Aristotle's patient of change).

blended, as the Stoics mention in the sponge experiment (Stobaeus 1.155; LS 48D).<sup>31</sup> So there is an ontological difference between the two types of blend. Both are blends, but in addition, there must be a relation of ontological dependence holding between *hylē* and *pneuma*, which does not hold between ordinary material objects that blend, such as water and wine. *Hylē* and *pneuma* do not depend on each other to be or become bodies—the Stoics presuppose that they are both bodies. Still, *pneuma* and *hylē* are different with respect to one being a qualified body and the other being a qualityless body. Although each of them as such is everlasting, they need to combine to generate our world of qualified individual material objects. I submit that the Stoics' description of *pneuma* as active and *hylē* as passive is their way to express the *interdependence* of the two for the existence of the universe, which is all that exists. This is in line with what Alexander of Aphrodisias reports, when saying (in T10, immediately below; see also T9 above) that for the Stoics, the relation of *pneuma* to *hylē* is what sustains and stabilizes the universe, and makes it interactive (*sumpathes*) with itself. This shows their interrelation to be necessary for the existence of the universe and for the existence of causal interaction in the universe.

T10: Alexander, *On Mixture* 225.1–2 (LS 45H)

They [the Stoics] say that god is mixed with matter, pervading all of it and so shaping it, structuring it, and making it into the world.

μεμίχθαι τῇ ὕλῃ λέγειν τὸν θεόν, διὰ πάσης αὐτῆς διήκοντα καὶ σχηματίζοντα αὐτήν, καὶ μορφοῦντα καὶ κοσμοποιοῦντα τούτῳ τῷ τρόπῳ.

So *hylē* and *pneuma* are (the only) active and passive bodies in the universe, and are always *interlocked* together everywhere in the

31. An oiled *sponge* dropped into a container of *water* and *wine* would be able to *separate* these totally.



universe. The interlocking is over and above their blending, since natural bodies that blend can separate, but *hylē* and *pneuma* cannot separate. In conclusion, on my reading (the tensile tenor of) *pneuma* has a constitutional-causal role, rather than efficient causal one, with respect to *hylē*; and it fulfills it by means of its colocation with *hylē*.<sup>32</sup> This constitutional-causal role results in the *necessary colocation* of *hylē* and *pneuma*. (By contrast, ordinary material substances, each of which is a blend of *hylē* and *pneuma*, are only contingently and not necessarily colocated.)

#### 6.4. SHARING SUBJECTS

The next question for us to address is: what results from the blending of two bodies? As we saw, there are two types of blending for the Stoics: between *hylē* and *pneuma* (see, e.g., Alexander, *On Mixture* 216.14–217.12; LS 48C1) and between blends of *hylē* and *pneuma*, which are the ordinary material objects in nature, e.g., water and wine (see Alexander, *On Mixture* 216.14–217.12; LS 48C4–12). Our sources have preserved a more detailed description of the latter type of blend, but we can reasonably assume that the two types of blend are underpinned by the same (physical) mechanism: *pneuma* pervades *hylē* the same way as composites pervade each other when thoroughly mixed. Let us examine first the case of the *pneuma-hylē*

32. My interpretation differs from an existing one that many share, represented, e.g., by A. A. Long and D. Sedley, who argue that

In order to do justice to Stoic intuitions, we should regard the *two things that occupy the same space* not as two determinate and independently existing bodies, but as the two bodily *functions* (breadth and matter) which *jointly constitute* every determinate and independently existing body. (1987: 294, my emphasis)

This line of interpretation rightly points out that the Stoics use colocation, of breath (*pneuma*) and matter (*hylē*), to account for the composition of composite things. It is true that two functions of a body, e.g., elasticity and its malleability, can be coinstantiated in the same matter. This is unproblematic because functions are not material bodies, but qualifications of matter. But *hylē* and *pneuma* are not qualities; the Stoics claim they are coextended not as functions, but as bodies.

blend. In general terms, we can say, with the Stoics, that in the blend *pneuma* endows *hylē* with properties and causal powers, but in a very specific way. The blending of propertyless *hylē* and *pneuma* results in the *qualification of the composite*, not the qualification of *hylē* itself. *Hylē* is by definition propertyless—it is also everlasting. So it cannot survive acquiring properties. So how can properties be bestowed on propertyless matter? The Stoics solve this problem with blending: the propertyless can be colocated with the qualified, and this suffices for it to be empowered with properties and causal powers. The mechanism the Stoics posit is *sui generis*. For Aristotle, matter instantiates a universal form; for Plato, objects participate in the Forms. For the Stoics, matter is colocated with, and interlocked with, (independently) embodied form(s), i.e., *pneuma*. Alexander describes in some detail the Stoic account of blended composite substances, and we can lean on it to understand their account of the blend of simples (*hylē-pneuma*) too:

T11: Alexander, *On Mixture* 216–17 (LS 48C4–9)

Other mixtures occur, he argues, when certain substances and their qualities are mutually coextended through and through, with the original substances and their qualities being preserved in such a mixture; this kind of mixture he calls specifically “blending”; . . . for the capacity to be separated again from one another is a peculiarity of blended substances, and this only occurs if they preserve their own natures in the mixture.

Since all this is so, they say there is nothing remarkable in the fact that certain bodies, when assisted by one another, are so *mutually unified* through and through that while being preserved together with their own qualities, they are *mutually coextended* as whole through and through, even if some of them are small in bulk and incapable by themselves of spreading so far and preserving their own qualities. (My emphasis)

τὰς δὲ τινὰς γίνεσθαι μίξεις λέγει δι’ ὅλων τινῶν οὐσιῶν τε καὶ τῶν τούτων ποιότητων ἀντιπαρεκτεινομένων ἀλλήλαις μετὰ τοῦ

τάς ἐξ ἀρχῆς οὐσίας τε καὶ ποιότητος σώζειν ἐν τῇ μίξει τῇ τοιαύτῃ, ἥντινα τῶν μίξεων κράσιν ἰδίως εἶναι λέγει. . . εἶναι γὰρ ἴδιον τῶν κεκραμένων τὸ δύνασθαι χωρίζεσθαι πάλιν ἀπ’ ἀλλήλων, ὃ μόνως γίνεται τῷ σώζειν ἐν τῇ μίξει τὰ κεκραμένα τὰς αὐτῶν φύσεις. . . ὦν οὕτως ἐχόντων οὐδὲν φασι θαυμαστὸν τὸ καὶ σώματά τινα βοηθούμενα ὑπ’ ἀλλήλων οὕτως ἀλλήλοις ἐνοῦσθαι δι’ ὅλων, ὡς αὐτὰ σωζόμενα μετὰ τῶν οἰκείων ποιότητων ἀντιπαρεκτείνεσθαι ἀλλήλοις δι’ ὅλων ὅλα, κἂν ἢ τινα ἐλάττω τὸν ὄγκον καὶ μὴ δυνάμενα καθ’ αὐτὰ ἐπὶ τοσοῦτον χεῖσθαι τε καὶ σώζειν τὰς οἰκείας ποιότητας. οὕτω γὰρ καὶ τὸν κύαθον τοῦ οἴνου κερναῖσθαι τῷ ὕδατι τῷ πολλῷ βοηθούμενον ὑπ’ αὐτοῦ εἰς τὴν ἐπὶ τοσοῦτον ἔκτασιν.

I take the coextension and the mutual unification or interlocking of bodies mentioned in T11 to coincide temporally, rather than to happen sequentially,<sup>33</sup> yet they are different events. The interlocking is the ontological dependence discussed above. As a result of colocation and interlocking, the blend itself comes to manifest the properties of one of the mixants. Whenever the mixants are *hylē* and *pneuma*, the *hylē-pneuma* composite becomes causally efficacious in virtue of the compresence of *pneuma*’s causal properties. I call this the *empowerment* of *hylē* with *pneuma*’s qualities. Although *hylē* does not come to possess the properties of *pneuma*, *hylē* can “use” them. So, e.g., the heat of the composite of *hylē* and *pneuma* is the *totality* of the heat present at the location of their blend, i.e., in this case, the heat of *pneuma*. In this way the composite of *hylē* and *pneuma* comes to be hot, and thereby the *hylē* too can be thought of as if coming to be hot.<sup>34</sup> The Stoics talk as if *hylē* is qualified by the properties of its compresent *pneuma*. But, as

33. While in T11 mutual unification is mentioned first and coextension second, in other passages from Alexander their order is reversed, and there is first coextension and then unification.

34. This way of thinking of how properties belong to a composite and to its matter is non-Aristotelian. On the other hand, it is like the way Platonic Forms come to be present in the receptacle. The receptacle does not become hot (in an Aristotelian sense), but somehow “houses” heat in it. (For the Stoics, for *hylē-pneuma* blends, *pneuma* is permanently housed in *hylē*; for causal blends, they are temporarily housed in each other.)

I argued, in the blend, one of the entities is qualified,<sup>35</sup> and the other is in the presence of the property, so long as the property continues to be present. The Stoics thus appear to distinguish between what we could call “owning a property” and “sharing its presence.” How do these relations differ metaphysically? I explain blends, whether between simple or composite substances, as *a type of plural subject* in relation to their property possession. An example of plural subjecthood, already discussed by Plato, is that you and I are two (but each of us is one and neither is two).<sup>36</sup> Other instances of plural subjects are William and Mary reigning over England, or the Romans defeating the Gauls, or you and I playing a duet, etc. Stoic blends are a special kind of plural subjects. Typically, in case of plural subjecthood, the two or more subjects involved *equally* share one property-instance. By contrast, blends comprise *unequal partners* with respect to the ownership of the properties—one mixant owns it, and the other shares in its presence. The Stoics are thereby introducing a different model of property possession, which I call *sharing subjects*, to distinguish them from plural subjects, allowing for inequality between partners.<sup>37</sup>

## 6.5. CAUSATION

In the Stoic system, I submit, that there are two different types of empowerment resulting from colocation of bodies.<sup>38</sup> I call them *property empowerment* and *structural empowerment* respectively, and they

35. *Pneuma* strictly does not possess properties but *is* properties. Otherwise the Stoics would need a further account of how *pneuma* comes to possess properties.

36. Plural subjects were known to the ancients, at least since Plato’s *Hippias Major*; see Scaltsas (2006).

37. Exploring the potential applicability of the Stoics’ sharing-subjects models beyond their metaphysics of blends is outside the scope of this chapter. Briefly, the sharing subjects model might offer to contemporary philosophy an ontology of complex activities where the subjects in the activities have a variety of roles and contribution, such cases as birth; punishment; etc.

38. One advantage that the Stoic account of blending has, both for instantiation of properties and for causal efficacy, is that it brings the active and the passive in

are both instances of causation. As we saw, there are two types of blend: blends of simple and of composite substances. Each of the two types of blend exhibits both types of empowerment. We have already discussed the *hylē-pneuma* blends. Since *pneuma* is both qualified and structured, its colocation with propertyless *hylē* empowers *hylē* with properties and structure. The same model also accounts for the blend of composite substances that are themselves blends of *hylē* and *pneuma*, and I will focus on these in what follows.

### 6.5.1. Property Empowerment

The example that follows is one that we would readily identify as one of efficient causation, where one composite substance makes another “acquire” a new property, in this case being hot. The mechanism is blending:

T12: Alexander, *On Mixture* 218 (LS 48C11)

They [the Stoics] say that fire as a whole passes through iron as a whole, while each of them preserves its own substance.

ἀλλὰ καὶ τὸ πῦρ ὅλον δι’ ὅλου χωρεῖν τοῦ σιδήρου λέγουσι, σῶζοντος αὐτῶν ἑκατέρου τὴν οἰκείαν οὐσίαν.

The interaction between fire and iron does not involve any transfer of a property trope from fire to iron—there is only colocation of two bodies: it is the fire that is hot, and iron is in the presence of fire. Iron is a sharing subject with fire, sharing heat through colocation with fire and thereby becoming empowered with heat without possessing it.<sup>39</sup> When iron and fire (which stands in for

contact *everywhere*, not only on the surface. This pays justice to our intuitions that the agent must be present where the effect occurs. This is an Aristotelian intuition (placing the effect of the action of the mover in the moved), but to which (Aristotle’s) surface contact in causal interaction does not pay justice.

39. Fire and iron relate to heat in very different ways, even if at the phenomenal level they both seem hot and we think of both as hot.

heat)<sup>40</sup> are blended, iron is vicariously hot, through the presence of fire in it; when the fire moves out of the iron, heat moves out of the iron, too. The Stoics see the hot iron as an amalgam.<sup>41</sup> When we say it becomes cool, they say fire departed. For the Stoics, a causal effect “stays with” its cause, in contrast to the Aristotelian, neo-Aristotelian, and generally modern conception of the effect coming to belong to the passive agent by changing it. Relevant to this point is the following text:

T13: Clement, *Stromata* 8.9.33, 2 (LS 55I)

A “sustaining” cause<sup>42</sup> is one during whose presence the effect remains and on whose removal the effect is removed.

συνεκτικὸν δὲ ἔστιν αἴτιον, οὗ παρόντος μένει τὸ ἀποτέλεσμα καὶ αἰρομένου αἴρεται.

This is the way sharing subjects work, metaphysically. The effect (being hot) remains until the cause (fire) is removed.

### 6.5.2. Structural Empowerment

To fully appreciate the philosophical significance of structural empowerment, it will be helpful to preface the discussion of the Stoics’ position with a very brief (and necessarily “gappy” in this context) excursus on how structure came into play in the history of metaphysics preceding the Stoics. The Milesians tried to account for everything in nature using (instances of) opposite powers, such as the hot and cold, wet and dry. On the other hand, the identification and reification of structure in ontology can be traced as far back as the first generation of thinkers after the Milesians. Most notably, Parmenides and

40. The Stoics do not distinguish, ontologically, fire from heat. For them there are no universals. Concepts are just descriptions of objects.

41. In physical terms, the heat of the two bodies, iron and fire, adds up while they are colocated, so that at the empirical level we find in that location hot iron.

42. The sustaining cause is typically for the Stoics *pneuma*.

Heraclitus built practically the whole of the universe out of structural features of being—a sphere that is simple, in the case of Parmenides, and process, in the case of Heraclitus. The generation right after them distinguished between opposite-properties and structure, and reified structure as equally primitively present in the universe as the opposite forces. For instance, Philolaus distinguished between the limiters and the unlimiteds. Anaxagoras posited (in addition to the opposites) primitive seeds in the ontology, from which asymmetrical individuals grow, as we saw in chapter 5. Empedocles believed that parts of asymmetrical bodies exist primitively in the universe. Plato was the first to introduce structural universals, e.g., the Form of Bed. He also introduced a criterion to distinguish structures from opposites, which was a breakthrough in the history of metaphysics: structural universals are not comparatives, while opposites are; the hot can be hotter, but a human being cannot be more of a human being. Nevertheless, Plato was reluctant to introduce structural properties in his theory of Forms, and he never developed an ontological account of structural properties, but only posited them, occasionally. After Plato, Aristotle championed structural universals with his substantial forms.<sup>43</sup>

The Stoics too distinguish structural from opposite properties, and develop a different account of the causation for each. They associate structural features and powers with *pneuma*. Alexander, for instance, says that when *pneuma* and *hylē* interact, “the whole of substance is unified by a breath which pervades it all, and by which the universe is *sustained* and *stabilized*, and made *interactive* with itself” (T9, my emphasis).<sup>44</sup> All these causal effects, which result from blending of *pneuma* and *hylē*, concern structural properties of objects in nature. *Pneuma* has these powers primitively, and *hylē* is endowed with them when *pneuma* and *hylē* blend. What is more difficult to understand is the structural empowerment between composites of

43. On this topic see, e.g., Scaltsas (1990).

44. The universe becomes interactive, *not* by acquiring new first-order opposite properties, which the *pneuma* already has, but by the *active* and the *passive* coming together.

*hylē* and *pneuma*, e.g., such as the blend of wine and water. Alexander gives three such examples: frankincense being burned, gold being mixed with drugs, and wine being mixed with water.<sup>45</sup>

T14: Alexander, *On Mixture* 217 (LS 48C8)

The supporters of this theory [of blending] advance as grounds for their belief in its truth the fact that many bodies preserve their own qualities whether they are present in evidently larger or smaller volume (as can be seen in the case of frankincense; when burnt it becomes rarefied, but it preserves its own quality over a very large extent), and the further fact that many bodies, which by themselves cannot advance to a certain size, do so with the assistance of others. Gold certainly, through being mixed with certain drugs, can be spread and rarefied to an extent which is not possible when it is simply beaten. . . . In this way too a measure of wine is blended with a large amount of water and *assisted* by it to attain an extension of that size.

Τοῦ δὲ τοῦτο οἶσθαι γίνεσθαι πίστεις φέρουσιν οἱ προιστάμενοι τῆσδε τῆς δόξης τό τε πολλὰ τῶν σωμάτων σώζειν τὰς ἑαυτῶν ποιότητας ἐπὶ τ' ἐλαττόνων ἐναργῶν ὄγκων καὶ ἐπὶ μειζόνων ὄντα (ὡς ὁρᾶν ἔστιν ἐπὶ τοῦ λιβανωτοῦ, ὃς ἐν τῷ θυμιάσθαι λεπυνόμενος ἐπὶ πλείστον τὴν αὐτοῦ φυλάσσει ποιότητα), ἔτι τε τὸ πολλὰ εἶναι, ἃ καθ' ἑαυτὰ μὴ οἶά τε ὄντα ἐπὶ τι ἐλθεῖν μέγεθος ὑπ' ἄλλων βοηθούμενα ἐπ' αὐτὸ πρόεισι. τὸν γοῦν χρυσὸν ὑπὸ τινων μιγνυμένων φαρμάκων ἐπὶ πλείστον χεῖσθαι τε καὶ λεπτύνεσθαι, ἐφ' ὅσον καθ' αὐτὸν ἐλαυνόμενος οὐκ ἐδύνατο. . . . οὕτω γὰρ καὶ τὸν κύαθον τοῦ οἴνου κερνᾶσθαι τῷ ὕδατι τῷ πολλῷ βοηθούμενον ὑπ' αὐτοῦ εἰς τὴν ἐπὶ τοσοῦτον ἔκτασιν.

In the above passage we read that for the Stoics the blended substances “preserve their own qualities, whether they are present

45. The first is a case of empowering via an event (burning) involving the other mixant (fire), while the second two cases are of empowerment by the other mixant's structure.



in evidently larger or smaller masses.” For instance, when a drop of wine comes to be present in the whole ocean, the wine survives and preserves its own properties, though it expands—where expansion is a *structural* alteration. How are the blended substances able to achieve what they do, in terms of structural modifications? The Stoics tell us something surprising, but in keeping with their theory. Such blended substances are *assisted* in different ways by their comixants to achieve what they could not achieve on the strength of their own natures. Presumably in the case under discussion the Stoics thought that the *bulk* of the water enables the drop of wine to spread to an extent to which it could not spread on its own powers. What is important about this model is that it shows that the Stoics distinguish causation that results in *property empowerment* and causation that results in *structural empowerment*. In the case of water and wine, what the one mixant “gives” the other is not opposite properties, e.g., being hotter or softer, etc. —it is that the structure of the one enables the other to alter structurally. In the second case, that of frankincense, two things happen: blending (and through structural empowerment, spreading) and burning. Burning destroys the body that has the frankincense, but the scent survives and blends with fire/smoke, which then spreads. What this case shows is that structural empowerment has its limits: frankincense is enabled to spread over a very large extent *only*. Beyond that extent, its nature *cannot* sustain it and it subsequently dissipates. In that sense, structure is being treated by the Stoics dynamically, as a power—it is effective over a range and then gives way. Finally, the example of gold, as described by Alexander in T14, is of particular interest to us, because it shows that the Stoics contrast the impact of efficient causation to blending: “Gold certainly, through being mixed with certain drugs, can be spread and rarefied to an extent which is not possible when it is simply beaten” (LS 48C8). The drugs blend with gold, thereby uniting with it and assisting it to spread while retaining its cohesiveness. Gold is thus structurally empowered to spread to an extent far beyond that which it could achieve on its own powers, even when beaten flat.

## 6.6. TYPES OF ONTOLOGICAL UNITY

Bringing together the interpretative results achieved so far in the chapter, I argue that the Stoics introduce the following types of ontological unity, all resulting from the colocation and blending of bodies that exist as unlimitedly divided:

- (i) *Hylē-pneuma* unity. This is the type of unity that the universe as a whole enjoys qua composite of *hylē* and *pneuma*, which have always been and will always be inseparably blended and interlocked together.
- (ii) Object unity. This is the type of unity that lumps of *hylē* and *pneuma* enjoy when they are physically unified and made into discrete material objects in the universe, through (the physical movements of) *pneuma*'s sustaining powers.
- (iii) Causal unity. This is the unity that causally interacting material objects in the world enjoy, which may result in property empowerment or structural empowerment (or both).

It is very interesting to note that none of these types of ontological unity that colocation of gunk allows the Stoics to have in their system are found in Anaxagoras's system. For Anaxagoras, compresent opposites in different proportions are unified phenomenally into lumps of stuff; movement of opposites, caused by the vortex or by the causal effect of other opposites on them, contributes to different concentrations of opposites.

The three types of unity above are all cases of blending, for the Stoics, and are to be contrasted to a fourth one, *fusion* (*synchysis*), which is described, for instance, by Alexander thus:

T15: Alexander, *On Mixture* 216 (LS 48C3)

Other mixtures occur by through-and-through fusion of the substances themselves and their intrinsic qualities, which

are destroyed together, as he [Chrysippus] says happens in the case of medical drugs when the things mixed together undergo mutual destruction and another body is generated out of them.

τὰς δὲ τίνας συγχύσει δι' ὅλων τῶν τε οὐσιῶν αὐτῶν καὶ τῶν ἐν αὐταῖς ποιότητων συμφθειρομένων ἀλλήλαις, ὥς γίνεσθαι φησιν ἐπὶ τῶν ἱατρικῶν φαρμάκων κατὰ σύμφθαρσιν τῶν μιγνυμένων, ἄλλου τινὸς ἐξ αὐτῶν γεννωμένου σώματος.

Usually interpreters understand fusion as involving destruction of *pneuma*, on account of Alexander's saying that the substances that are fused have their qualities destroyed, as, e.g., in the mixture of medical drugs. I argue for an alternative interpretation of fusion as a special type of causal interaction and mixing, and I consider an advantage of my interpretation that it does *not* attribute to the Stoics the belief that *pneuma*, which is god, gets destroyed when fusion occurs. I take the Stoics to distinguish two types of causal interaction between material objects, one resulting in blending (which can bring about property and structural empowerment), and the other resulting in fusion. The criterion that differentiates these two types is this: the unity of the objects involved in causal interaction is put under stress, as it were, by the novel causal unity that the causal interaction brings about. Object unity and causal unity compete with each other for different outcomes. If the object unity of the entities involved in causation is stronger than their causal unity, the objects and their qualities are preserved, in a blend. By contrast, if the object unity is weaker than the causal unity, the object and their qualities dissipate, in a fusion. So on my interpretation the destruction of the objects and their qualities in fusion is the loss of physical unity and continuity by each of the objects (rather than literal destruction), and hence their dispersal and disorganization. It is literally, as the Stoics call it, "confusion."

## 6.7. CLOSING REMARKS

In this chapter my aim was to discuss an alternative gunk ontology in antiquity as a means for comparison and further understanding of Anaxagoras's gunk ontology. I argued for the centrality of gunk in Stoic metaphysics and explicated its distinctive features. The Stoics' guiding principle in ontology is the Eleatic Principle. Their existents are bodies that have the power to act and be acted upon. Gunk is fundamental for Stoic ontology, as it enables them to explain both the constitution of material objects and the causal interactions among them, with the *physical* mechanism that gunk makes possible, that of thorough blending. Bodies can blend through and through because, for the Stoics, all bodies exist as unlimitedly divided.<sup>46</sup> The Stoics innovate metaphysically in their account of blending by holding that, when blended, the substances involved become sharing subjects of qualities and structural features. The model of sharing subjects explains how colocation has both physical and metaphysical impact on colocated bodies. It presupposes ontological dependence (the "mutual unification" in a blend), which is primitive in their system. By means of colocation and ontological dependence, the Stoics produced an account of the mutual empowerment of blended bodies which explains in their system the constitution of material objects (*hylē* and *pneuma*), their composition (e.g., water and wine), and their causal interaction (e.g., iron and fire). In so doing, the Stoics developed a more complex metaphysical system than that of Anaxagoras, the first gunk lover in Western thought. It is a significant achievement that the Stoics could account for core and complex metaphysical issues without reifying abstract properties and universals, contrary to what their towering predecessors Plato and Aristotle had done, and it is philosophically and historically interesting that the Stoic account is in significant ways in keeping with Anaxagoras, rather than with their immediate predecessors.<sup>47</sup>

46. But not all bodies blend; see footnote 9.

47. This chapter draws largely on my paper "Stoic blends", forthcoming in the Proceedings of the Boston Area Colloquium in Ancient Philosophy.

# Conclusions

Anaxagoras posits as the foundation of his philosophical system an ontology of causal powers which includes opposite physical qualities (such as the hot, the cold, etc.), as well as intelligent powers (such as the seeds and *nous*). These different types of powers do different metaphysical work in Anaxagoras's system: the opposites serve as the fundamental building blocks of all there is,<sup>1</sup> the seeds provide structures for the growth of living beings, and *nous* embodies the cosmic plan for everything in the universe. Anaxagoras's powers are particular (tropes, in our modern terminology),<sup>2</sup> and remain eternally the same, both in multitude and in being. Importantly, there is no distinction in his system between powers in potentiality and activated powers—his powers are permanently exercising their constitutional causal role.

Anaxagoras's world abides by Parmenidean ontological principles. Yet it is a world which has an origin and admits of change (in a qualified sense). The world originated from a primordial mixture of all opposites, which *nous* set in motion by means of a cosmic vortex. Since then, the opposites have been dispersing in space, and in so doing they have clustered in different concentrations into bundles, making up kinds of stuff, and also around seeds, making up organisms. Stuffs and organisms are what we would call mereological composites, and in this sense only, they are new entities in the system. Composition is unrestricted for Anaxagoras, a position also

1. Except *nous*, which is unmixed.

2. They are not instantiated universal properties.

motivated by his endorsement of Parmenides's principles. The opposites can recombine into any sort of bundle, each of which contains all the kinds of opposites, but it contains some of the opposites in higher concentrations than others. This makes it possible that anything can literally "come out of" anything, without there ever being the sort of creation (or destruction) of being which Parmenides had vetoed. Anaxagoras expresses this position by saying there is a share of everything in everything.

This brings us to the crux of Anaxagoras's system. I have shown that the existing interpretations of Anaxagoras's tenet of everything being in everything encounter insurmountable textual and philosophical difficulties. I have argued for an alternative interpretation, not in terms of *containment*, but in terms of the necessary *compresence* of the shares of all the kinds of opposites. The extant texts support this latter way of understanding Anaxagoras's thought. But how can the opposites be compresent with each other, everywhere? To address this, Anaxagoras pioneers a conception of the building blocks of reality, the opposites, as *unlimitedly divided*. This requirement makes his power ontology unique. Each given share of an opposite has proper parts into which it is divided (where its proper parts are opposites of the same kind).<sup>3</sup> From this it follows that for any given share of an opposite, its parts are endlessly many. Furthermore, it follows that the parts of each opposite approach zero extension: the series of divisions of each share of an opposite is unlimited, but always remaining within the domain of the extended. The shares of the opposites can thus overlap with every other in space, being nearly extensionless. Since each kind of opposite is unlimited in amount, and since their shares can overlap, each kind of opposite can be everywhere, and thus there is no region of space that will lack any kind of being in it. Thus, no change in the universe needs to be explained by the creation of being from nonbeing in Anaxagoras's system, since every kind of being is everywhere in the universe.

3. Recall that the opposites are homoeomers.

In holding this view, Anaxagoras's ontology represents a landmark in the history of metaphysics. We might call Anaxagoras the first gunk lover, where gunk is the term that modern metaphysicians use to refer to the view that the building blocks of reality (the opposites, in the case of Anaxagoras) are atomless. Anaxagoras thought of the opposites as gunky, and used their ontology to solve all sorts of metaphysical problems about things, and give an analysis of change in the world. The problem his system faces is that the gunky nature of opposites is the *only* metaphysical tool Anaxagoras uses to explain metaphysical phenomena in his system, including the formation of different kinds of stuff. This is, I think, one explanation too many, and one which gunk could not deliver. But Anaxagoras did not know this, and could not have known it, in view of the fact that the understanding he was missing required two more millennia of mathematical progress to be sufficiently grasped.

Anaxagoras is not merely the first to hold a view that modern philosophers, too, are interested in. He puts forward a conception of gunk that has not even been considered (yet) in contemporary philosophy—we explore *material* gunk, while Anaxagoras posited *qualitative* gunk at the foundation of his system. Investigating his arguments (to the extent to which we can reconstruct them, given the scarcity of the surviving texts) gives us a new way to think about gunk, and is thus of value both for the sake of understanding Anaxagoras's thought and for expanding our present philosophical horizons.

Interestingly there is one other philosophical system in antiquity that is grounded on the same conception of reality as atomless: the Stoics'. The considerations leading the Stoics to this assumption are very different from Anaxagoras's, and are not motivated by Parmenidean concerns. Coming after Plato and Aristotle, the Stoics aim to develop a corporealist account of reality that programmatically has no room or need for abstraction and universals. Since Plato, and particularly Aristotle, and all the way to our current age, metaphysicians have overcome the restrictions imposed on philosophical explanations by physical laws by introducing abstract entities

such as universal properties and underlying substrata, which can be individuated only by abstraction. These entities are not subject to natural laws, such as that two material objects cannot occupy the same space. For instance, matter and form for Aristotle are abstract entities<sup>4</sup> that make up material objects as hylomorphic composites. By and large, abstraction is the operation that supports most of the ancients', as well as our explanatory practice in metaphysics. But Anaxagoras and the Stoics are two exceptions. They developed an alternative (and formidable) way to account for the constitution of objects which enables them to give metaphysical explanations free of abstract entities: this is unlimited division. Unlimited division is not abstraction—nevertheless, it can explain spatial overlap of physical entities, and overlap or compresence provides a physical mechanism for accounting for various core metaphysical issues (such as the composition of material objects, their property possession, and causation). Exploring this strand of thought in ancient metaphysics enables us to discover new connections between thinkers that are historically far apart and yet share core philosophical assumptions. In this way, we illuminate a pattern present within the various philosophical accounts of reality that have been proposed throughout the ages, one that, on account of the towering contributions of Plato and Aristotle and their significant impact on the history of metaphysics, has remained hidden from our attention.

4. I argue for this interpretation in Marmodoro (2009 and 2013).





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